EXHIBIT A
PART 1 OF 2

REDACTED VERSION OF DOCUMENT SOUGHT TO BE SEALED

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

ORACLE AMERICA, INC.,	)	
	)	
Plaintiff,	)	
	)	
v.	)	Civ. A. No. 10-03561 WHA
	)	
GOOGLE INC.,	)	*(Jury)*
	)	
Defendant.	)	

EXPERT REPORT OF PROFESSOR ADAM JAFFE, Ph.D.

[CORRECTED]

FEBRUARY 8, 2016

EXPERT REPORT OF ADAM JAFFE, PhD

CONFIDENTIAL – ATTORNEYS' EYES ONLY
PURSUANT TO PROTECTIVE ORDER

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on this 8th day of February, 2016, in Wellington, New Zealand.

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Adam Jaffe, PhD

I. ASSIGNMENT

1. I have been retained by plaintiff Oracle America, Inc. ("Oracle") to undertake an analysis of whether Google Inc.'s ("Google") use of Oracle's copyrighted works constitutes a "fair use." Specifically, I have been asked to analyze from an economic perspective (1) the purpose and character of Google's use of Oracle's copyrighted works, and (2) the effect of Google's use upon the potential market for or value of the Java platform. In addition, I have been asked to respond to certain assertions in Dr. Owen Astrachan's report that are fundamentally economic in nature. The opinions and information contained in this report are based on my knowledge and understanding of the currently available record. However, my study is ongoing, and expert witnesses' depositions have not yet occurred. Accordingly, I reserve the right to revise and/or supplement my expert opinions to reflect any additional analyses I may formulate based upon additional testimony, newly acquired information, court determinations on evidence that will be excluded at trial, or views expressed by the parties' expert witnesses. I also expect to create trial demonstratives including graphical depictions and presentations of my opinions.

2. A list of the materials I have relied upon in the course of preparing this report are in Exhibit A.

II. QUALIFICATIONS

3. I am Director and Senior Fellow at Motu Economics and Public Policy Research in Wellington, New Zealand, and the Fred C. Hecht Professor in Economics Emeritus at Brandeis University in Waltham, Massachusetts. From 2003-11, I was Dean of Arts and Sciences at Brandeis. Before becoming Dean, I was the Chair of the Department of Economics. Prior to joining the Brandeis faculty in 1994, I was on the faculty of Harvard University. During the academic year 1990-91, I took a leave of absence from Harvard to serve as Senior Staff Economist at the President's Council of Economic Advisers in Washington, D.C. At the Council, I had primary staff responsibility for science and technology policy, regulatory policy, and antitrust policy issues.

4. I have authored or co-authored over eighty scholarly articles and two books. I have served as a member of the Board of Editors of the American Economic Review, the leading American academic economics journal, as an Associate Editor of the Rand Journal of Economics, and as a member of the Board of Editors of the Journal of Industrial Economics. I am a Research Associate of the National Bureau of Economic Research (NBER), in which capacity I co-founded and co-directed for many years the NBER Innovation Policy and the Economy Group. The website http://ideas.repec.org/, hosted by the Federal Reserve Bank of St. Louis, which ranks economists based on the strength of their scholarly

publications, ranks me in the top 1% out of approximately 35,000 economists worldwide, and Google Scholar indicates that my publications have received almost 40,000 citations.

5. At Brandeis and Harvard, I have taught graduate and undergraduate courses in microeconomics, antitrust and regulatory economics, industrial organization, law and economics, and the economics of innovation and technological change. I have served as a consultant to a variety of businesses and government agencies on economic matters, including antitrust and competition issues, other regulatory issues, and intellectual property matters, including patents and copyrights. I have worked on projects for clients from California (software patent litigation), Alaska (oil transportation tariffs), Utah (regulation of gas pipelines), Idaho (competition in the electric sector), Texas (railroad contract dispute) and New York (music license royalties), among others.

6. I have been qualified as an economic expert in federal courts in the Southern District of New York (proper basis for music performance license fees in cable television, 2001; appropriate structure and benchmark fee for music performance license in background music service, two separate cases 2010), Idaho (evaluating market power and allegations of anticompetitive behavior, 2002), and in the District of New Jersey (commercial success as a factor in patent obviousness determination, 2009). My testimony has also been accepted and used by state courts, state regulatory agencies, the Federal Energy Regulatory Commission and its Administrative Law Judges, private arbitration panels, and arbitration/royalty panels convened by the U.S. Copyright Office/Library of Congress.

7. I have consulted for both owners and users of intellectual property on its valuation and the interaction between intellectual property and competition. I have consulted for the Copyright Clearance Center on the valuation of photocopying licenses and the American Chemical Society on paper and digital journal subscriptions and the relationship between the two. I chaired the Brandeis committee that drafted its current Intellectual Property Policy. I have testified on behalf of both plaintiffs and defendants in patent cases involving a consumer product, a medical device, a software program, and pharmaceuticals. I testified at the request of the Chairman before the U.S. House Subcommittee on Courts, the Internet and Intellectual Property on patent policy reform. I have testified in arbitration proceedings under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) regarding the valuation of test data with respect to the safety of pesticides.

8. I am being compensated in this matter at my standard rate of $1,200 per hour. This compensation is not contingent in any way upon my testimony or upon the result of this proceeding. A copy of my CV is attached as Appendix A.

III. SUMMARY OF CONCLUSIONS

9. This case provides us with an unusually strong foundation in assessing economic impacts. Rather than guess at the future outcomes of Google's unauthorized copying of Oracle's copyrighted work, we have nearly a decade of evidence required to determine fair use – namely, the degree of commercial exploitation that Google made of its unauthorized copying of key elements of the Java platform (which I understand to be an application platform and to which I will refer as "Java", "the Java platform", or the "Java application platform") and the totality of the harm to Oracle from Google's conduct. It is from this actual evidence of real-life outcomes that I can readily determine that Google's copying of the Java API packages demonstrate none of the economic indicia of fair use.

10. Google and Sun Microsystems, Inc. ("Sun") began discussions about Google licensing the Java platform in the mid-2000s, as consumers were in the process of transforming their digital behavior -– from a tethered personal computer ("PC") world to a mobile one. After a decade of establishing a search and advertising platform, Google faced serious challenges in protecting its gains in the increasingly mobile world. New gatekeepers emerged that could undermine all that Google had accomplished. Wireless carriers, mobile phone manufacturers and a shift from browser- to app-based consumption, coupled with the rise of Apple and its iPhone all presented serious risks to Google's future. Google executives acknowledged these risks and set a path to establishing a mobile ecosystem under the control of a Google application platform called Android. The feat of establishing a new, viable mobile application platform is a precarious one that tech giants including Microsoft, Facebook and Amazon have failed to accomplish.

11. Google's strategy relied on rapidly attracting a force of application developers that would compel users, carriers and Original Equipment Manufacturers ("OEMs") to adopt the Android ecosystem. Google surveyed all available options, from creating its own application platform to adopting available technologies. It landed firmly on Java, and its robust APIs and 6 million strong developer community. Sun had built those assets through over a decade of investment and with them had already captured the lion's share (approximately 80%) of the nascent mobile application platform market. Sun was open to licensing its Java platform to Google and continuing to furnish its technologies to a new mobile environment. Google instead chose to without authorization copy the Java API packages and integrate them into its Android platform in the same way as their original use without authorization and to build Android's business at Sun's and now Oracle's great expense.

12. Those decisions made by Google and its executive team set both parties on a course, the economic outcomes of which are now readily observable. Google used its Java-based Android operating system to capture approximately 80% of the users, carriers and mobile phone OEMs that make up today's mobile market. In so doing, Google has reaped over [redacted] in revenue and has secured its search and other advertising business from the competitive forces that threatened its existence. Having built a mobile phone juggernaut, Google set off to capture an array of other device categories, from connected cars to home entertainment and beyond – all of which were formerly powered by the Java platform, or were clear candidates for inclusion of the Java platform.

13. The economic implications are straightforward. Android's unauthorized use of the Java API packages competes with and substitutes for the Java platform. Google's gain is Oracle's loss. From an economic perspective, this is not fair use. I proceed in this summary section to describe my key findings and to provide a roadmap to the analyses in this report on which they are built.

A. Key findings

14. The economic purpose of copyright is to preserve and enhance the incentive for the production of creative works. Copyright provides economic rewards to creators. Copyright gives creators the ability to promote the widespread dissemination and use of their works in a manner of their choice. Fair use provides a limited exception to copyright protection in certain specified circumstances.

15. It is my understanding that whether or not copying of copyrighted material can be considered fair use is based on consideration of four factors. The first and fourth factors involve considerations that call for economic analysis. Factor One pertains to "the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes," and concerns: (a) whether the use serves a commercial purpose, and (b) whether and to what extent the new work is "transformative." Factor Four, concerning "the effect of the use upon the potential market for or value of the copyrighted work," considers the effect of the use upon the potential market for or value of the copyrighted work.[1] I proceed with an economic analysis of each of these factors.

16. The Java platform is a valuable economic asset created by Sun and now owned by Oracle. Copyright operates to protect the value of that asset by preventing others from copying parts of Java in ways that are inconsistent with its owners' dissemination and use plans. Oracle reaps the rewards of its copyrighted creation by licensing it to various parties and, on occasion, enforcing its copyright interests when it discovers an unlicensed use of Java in the marketplace. From its beginning, Java has been

[1] 17 U.S.C. § 107(4). Oracle America, Inc. v. Google Inc., Fed. Cir. 2013-1021, -1022 (May 9, 2014 Decision).

licensed in an evolving set of device contexts, such as mainframe computers, desktop personal computers, ATMs, mobile phones, personal digital assistants ("PDA"), TVs, and smart cards. In each of these new contexts, Java has been implemented to perform in the same way: as a software applications platform.[2] As an application platform, Java allows developers to write a program once for a specific edition and be assured that it will work in the same way on all devices that support that edition ("write once, run anywhere"). In licensing Java for use in each of these commercial device implementation contexts, Sun, and now Oracle has sought to ensure the compatibility expressed in its "write once, run anywhere" motto. Compatibility is important because it means developers can count on applications written for one Java device running on a different device in the same context (*e.g.*, a program written for a Windows desktop PC that is, without modification, capable of running on an Apple desktop PC).

17. Except for Google and its development of Android, most, if not all, commercial entities implementing Java for use in a device have done so under a commercial license. In 2005, Google initially approached Sun for a license to use Java in Android, but decided to walk away from negotiations. Instead, Google simply copied portions of Java and incorporated it into Android. Sun discovered this after Android's public source code release in 2008 and engaged Google for further licensing discussions in 2008 and in subsequent years. Each time, Google refused to take a license to Java.

18. Java-based Android secured for Google much of the benefit of developers' being able to quickly provide applications for Android. But, Google's Java-based Android was not and is still not compatible with Java. I understand from Professor Schmidt that over time Android has continued to evolve incompatibly from Java. This non-compatibility reduces the value of Java to developers and device manufacturers and hence reduces its value for its owner.

19. By the mid-2000s, Java was the pre-eminent software application platform for seamless interaction between devices (such as computers and phones) and applications ("apps"). As the mobile market took off, Sun was poised to take off with it. Google severely undermined Sun's and now Oracle's presence in the mobile market when Google released its unlicensed Java-based platform, Android.

20. Google chose to use Java in order to enter the mobile market quickly and gain the benefit of rapid adoption among developers.[3] This reduces the value of Java to other potential developers and device

[2] I understand that there are several distinct editions of Java, each designed for classes of computing devices based on resource constraints.

[3] As further detailed in Dr. Kemerer's report of January 8, 2016, Google chose to use Java without the necessary license for use in Android to "(1) enable quick time to market, (2) quickly enable high quality development through leveraging the community of Java developers who were already familiar with the Java API packages, and among whom the Java API packages were already popular and (3) enable deployment of applications on a wide variety of

manufacturers and hence reduces its value for its owner. Thus Google took advantage of the large Java developer base and ecosystem (which was comprised of OEMs and carriers) that Sun had built by investing substantial resources over decades. Android was successful in attracting app developers, users and OEMs. Android soon gained a predominant share of mobile phones. As a result, Oracle's Java was crowded out of the most important device market of the last decade.

21. Google's use of Java API packages in Android is highly commercial. Google's overarching commercial strategy is to sell advertising, initially on its search results pages and then in apps. Google extended this strategy through the launch of Android, which from the beginning was designed to grow and protect Google's advertising revenues. Google's Android platform also includes the Google Play store, where Google offers for sale millions of apps and digital content to Android users, generating over [redacted] in revenue in 2015 alone.[4] The fact that Google does not demand royalties for and instead actually subsidizes the use of Android by phone manufacturers reinforces the commercial nature of the enterprise, just as the free distribution of programming by the original over-the-air television stations does not undermine their very commercial nature.[5] Google's enormous commercial success with Android was highly dependent on its copying of the Java API packages, as this allowed the Android platform to launch during a critical competitive window and to grow quickly.

22. Google's use of Java API packages in Android was not transformative. The Java API packages have always served as an important component of the Java platform. Google took a portion of the Java API packages, and used them to construct a substitute software application platform. In doing so, Google significantly reduced Oracle's opportunity to license those API packages for use on mobile devices. In addition, Android's rapid adoption led to the decline of competing Java-licensed software. This reduced Oracle's opportunity to license Java to be used as the software application platform for non-Android phones.

23. In addition, Java's value to Oracle is a function of the size and diversity of the applications developer community working in Java. By creating a software application platform built on Java but incompatible with it, Google has constrained the potential growth of the Java developer community and the number of Java-compatible apps, even as Oracle attempts to resist these constraints by continuing to develop its Java platform and cultivate the Java developer community. Because of Java's "write once, run

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devices" (including because Java was widely adopted and successful among OEMs and carriers). Expert Report of Dr. Chris Kemerer, January 8, 2016.

[4] GOOG-00103813.

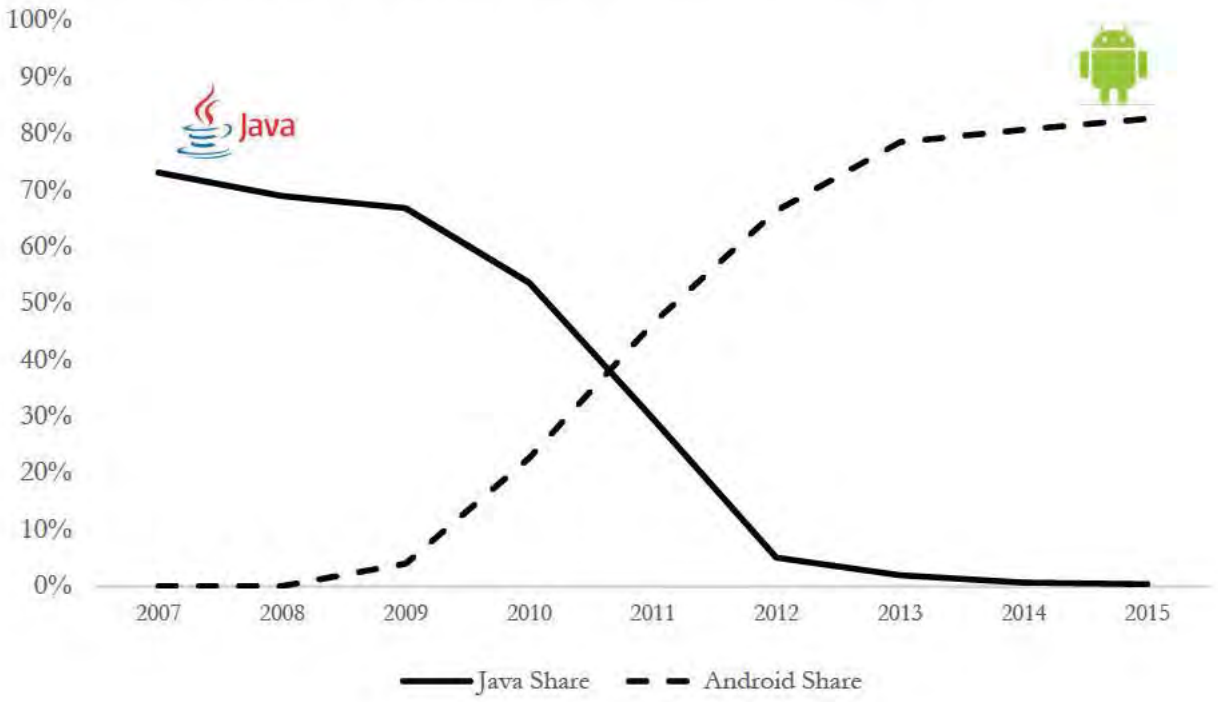
[5] Deposition of Jim Kolotouros, Jan. 26, 2016, pg. 98.

anywhere" principle, this reduction in the potential growth of the developer community creates harm across all of the device markets in which Oracle has or could license Java to device manufacturers. This also reduces the incentive for operating system designers and equipment manufacturers to build their new systems based on Java. This has likely led to fewer licensees and, especially given Android's price tag, reduced revenue from the licensees that Oracle does retain.

24. Oracle experiences significant potential market harm from Google's copying of the Java API packages. In 2007, approximately 80% of mobile phones worldwide incorporated the licensed Java platform. In 2008, Google released its Java-based Android operating system. At the time, users were beginning to shift their Internet consumption from the PC to mobile, and particularly, mobile apps. Additionally, it was a strategic imperative for Google to address the competitive threat posed by other mobile phones and mobile platforms, and to extend Google's PC search and other advertising monetization engines to a Google-controlled mobile platform. Given the dynamic nature of platform competition, if Google had not built Android with the Java API packages and therefore suffered a delay while creating its own alternative, such a resulting delay in introduction and reduction in its developer base may well have hindered Android to the point that it would not have emerged as the major alternative to iPhone. It is the nature of platform competition that "early entry" to achieve necessary scale is critical to platform success. Google was neck-and-neck with Apple and other competitors to introduce mobile platforms and achieve that necessary scale. Google needed to ensure continued traffic for its advertising platform on mobile devices. Google did so by developing an releasing the Android platform using Java in order to ensure developer uptake and using revenue-sharing subsidies in order to ensure carrier and OEM uptake. Android's success allowed Google to enjoy unprecedented advertising revenues. It also inflicted great market harm on Oracle.

25. Neither Oracle nor Sun before it receives any of Google's sizable gains from its success with its Java-based Android platform: more than [redacted] in revenue and the extension of its search and other advertising platform to mobile. Further, Google's copying of the Java API packages without permission or license deprived Oracle of the right to participate in Java-based Android's success in mobile. Figure 1 below shows the decline in licensed Java and the benefits to Java-based Android following Android's growth.

Figure 1: Java-based Android vs. Licensed Java Smartphone Market Share[6]



That harm continues, as Google brings its Java-based Android platform to an array of other embedded devices, such as automobiles, wearables, set-top boxes and household appliances that are actual and potential markets for Java licensing. Java licensing revenues have drastically decreased not only for mobile phones but also for these other types of embedded devices.

26. The existence of an open source licensed version of Java, called OpenJDK, does not make Google's use of the Java API packages a "fair use." From an economic perspective, it is perfectly logical for a rights holder to make its intellectual property available free-of-charge (but not free of restrictions and obligations) in some contexts while still seeking to control it, and receive compensation for its use in other contexts. My understanding is that OpenJDK is intended to provide its community a framework for experimentation and development and internal use of Java, but under terms that typically make it unattractive as the basis for commercial exploitation. The claim that Google could have used OpenJDK for its Android implementation in 2007 is economically doubtful because: (1) Google faced known risks (and made "enemies") using Java API packages without a license and therefore, it does not make sense for Google to have borne those risks if they could easily have been avoided, and (2) the fact that no other major commercial device manufacturer has gone this route suggests that the restrictions imposed by

[6] See Exhibit 3.

OpenJDK's license—"GNU General Public License, version 2, with the Classpath Exception 2.0" ("GPLv2") among other licenses — do, in fact, make commercial exploitation under that license impractical. Google's own acknowledgement of the significant risk that GPL-related licensing presented to partner adoption of Android must be considered in concert with the time-to-market imperatives for Android. Google required the partnership of OEMs and carriers to be able to successfully launch Android; putting those partnerships at risk would have undermined Google's ability to achieve early entry and attendant scale benefits and could have threatened the ultimate success of Google's mobile ecosystem.

B. Report structure

27. I begin with the foundational business structures that economists use to understand how particular markets work and how companies compete. In Section IV, I describe the key foundational economic considerations and basic histories of Oracle and Google and how they make money from Java and Android. The business models are common to the digital age, but rather new in the sweep of economics. They require a bit of an introduction to the economics of network goods and platform markets, as both Java and Android exhibit characteristics of these types of businesses. In short, those business approaches involve subsidizing some users to build an audience and then monetizing that audience via sales to another side of the market. In the case of Oracle, this means that application developers can use Java royalty-free, but OEMs and other platform providers pay for the Java platform and get to enjoy the benefits of millions of developers writing applications. In the case of Google, this means giving services to users like search or maps, and providing OEMs and carriers with an application platform like Android, all in the service of tracking user behavior and selling access to users and their online footprint to advertisers.

28. In Section V, I turn to the conduct at issue in this case. I look at the opportunities and threats that Google faced as users shifted to mobile. With this context, I then describe the breakdown of the negotiations between the parties and Google's decision to copy the Java API packages into Android without taking a required license.

29. In Section VI, I provide an overview of the economics of intellectual property and copyright law. This leads directly into Sections VII, VIII and IX, which set forth my analysis of Google's conduct and its effects on Oracle. These analyses address Factor 1 and Factor 4 of the fair use test. I understand that these factors are the most critical in the test for whether an unauthorized copying of a copyrighted work is permitted as a "fair use" exception to infringement. This makes sense when one considers that copyright provides a limited monopoly for the purpose of enhancing creation and dissemination of creative works,

and the purpose of fair use is to permit limited exploitation without material economic impairment of the value of the copyrighted work. I understand that courts have held that a decline in copyright value due to disparagement or parody may be a fair use, but a decline in value due to substitution is not. In these sections, I rely on the material established in the earlier background sections and bring in additional evidence and analysis to present a full understanding of the primary issues that must be considered to determine fair use under Factor 1 and Factor 4.

30. For Factor 1, I assess the degree of commerciality in Google's copying of the Java API packages, and whether Google's use is of a similar or different (transformative) purpose for those API packages than the use that Sun and then Oracle have made of them. For Factor 4, I asses the harm to Oracle from Google's unlicensed copying of the Java API packages. This Factor 4 analysis considers the actual, observed harm in the form of lost deals and missed opportunities in the case record, as well as harm to "potential" Oracle markets. Factor 4 also asks us to consider additional harm, if any, were the conduct at issue in the case to become more widespread – or put another way, the harm to Oracle should all market participants be allowed to copy the Java API packages without a license.

31. I find that the economic factors clearly point to a finding that Google's copying of the Java API packages is not a fair use. Under Factor 1, Google's Java-based Android is highly commercial. Android is particularly directed to protect Google's business strategy and increase its profits. Google's use of the Java API packages is in a manner similar to Oracle's and, because of this, Android acts as a competing substitute for the Java platform as an application platform. Under Factor 4, I find overwhelming evidence that Google's Java-based Android caused Oracle significant market harm, with Android succeeding at the direct expense of the Java platform across mobile and many other device categories critical to Oracle's business operations.

IV. BACKGROUND

32. In this section, I review the key economic concepts at issue in the competition between the parties in this matter. I provide an overview of the history and business models of Sun's and Oracle's Java platform as well as Google's search and other advertising businesses. I pay particular attention to the rise of mobile phones, its key industry participants and how the parties' businesses were affected by this rise.

A. Network goods and platform markets

33. The economic analysis of the fair use factors requires particular attention to the nature of the products offered by the parties embodying the copyrighted work, the economics of the markets in which they compete and the dominant technology and innovation trends surrounding the conduct at issue. In this

section I will introduce the important relevant economic concepts of network goods and platform markets. The firms involved, Sun/Oracle and Google, offer goods with network effects and have competing platforms. It is also important to understand the background of these companies' development, their product offerings and how they ultimately find themselves in competition. Finally, the emergence of mobile phones is the essential technology trend that underlies the conduct in this matter. In this section, I provide an overview of each of these elements of the case.

1) The economics of network goods

34. The products at issue in this case, the Java platform and the Android platform, are examples of network goods. Network goods are products or services that become more valuable to each user as the number of users increases. Common examples of network goods in the technology space include telephones, email, and fax machines. For instance, when only a few people had telephones, telephones were not very useful because there was almost no one to call. But as adoption rates increased, the telephone became incrementally more valuable to each existing user.

35. The incremental benefits experienced by existing users in a network are an example of what economists call "positive externalities." Economists use the term externality to describe circumstances in which one party makes an economic decision that has consequences for some other party that are "external" to the market transaction. This is intended to stand in contrast to benefits conveyed through market exchange. When my barber cuts my hair, I get a benefit, and I pay the barber for the benefit delivered – a market exchange. When I buy an Android phone, I get some benefit from the use of the phone, and I pay the phone manufacturer for that benefit. These effects are all internal to the market transaction. In the case of the Android phone, however, when I add myself to the Android system, I also create benefits for other Android users and for parties that seek to develop apps for Android, because having more Android users makes the overall Android ecosystem more valuable to them. They do not pay me for that benefit, so it is an "externality."[7] The positive externalities associated with network goods are also sometimes called "network effects."

36. Networks do not spring up instantaneously, but rather grow endogenously over time. For this reason, expectations also play an important role in network economics. If users have a choice between two or more networks to join for a particular purpose, the network effects mean that, all else equal, they want to be part of the larger network. In fact, researchers have shown that for markets with strong

[7] Externalities can be negative rather than positive. When a factory pollutes the environment in the process of making its products, it harms us all, and we are not usually paid any compensation for the harm that we bear. Hal R. Varian, Intermediate Microeconomics 557 and 591 (W. W. Norton & Company, 4th ed. 1996), p. 557

network effects, the size of the network can be more important even than product quality.[8] In addition, since it is typically costly to switch networks once you have joined, users (or developers) want to join the network that ultimately will be the largest, not just the largest at the moment (though being the largest at the moment may be perceived to imply largest later). So users tend to join the network that they believe or expect will be most successful, thereby contributing to its success. In this way, the success of a network can depend on self-fulfilling expectations, so that success or failure in quickly achieving a "critical mass" of users can determine which new networks succeed and which fail in the long run.[9] The advantage achieved in the early stages can last decades (*e.g.*, Microsoft Windows).

2) The economics of platform markets

37. In some cases, network goods are enhanced or facilitated by a "platform." In a platform market, one or more groups of market participants are brought together by a common medium, known as the platform.[10] One or more of the groups connected to the platform is typically characterized by network effects, and part of the purpose of the platform is to facilitate the growth of such networks, thereby enhancing the positive externalities associated with the network.[11]

38. Table 1 provides examples of platform, or two-sided, markets.

[8] Zhu, Feng, and Marco Iansiti. "Entry into platform-based markets." Strategic Management Journal 33.1 (2012).

[9] Michael Katz and Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 (3) The American Economic Review (1985).

[10] *See generally* Marc Rysman, *The Economics of Two-Sided Markets*, 23(3) J. Econ. Perspectives 125 (2009); Jean-Charles Rochet and Jean Tirole, *Platform competition in two-sided markets*, J. European Economic Association 990 (2003); Jean-Charles Rochet and Jean Tirole, *Two-Sided Markets: A Progress Report*, 37(3) RAND J. Econ 645 (2006).

[11] The use of the word "platform" in economics is distinct from its use in software engineering. A software engineering platform is a program or set of programs upon which other programs build. Definition of: software platform, PC Mag, http://www.pcmag.com/encyclopedia/term/61977/software-platform, Last visited Feb. 8, 2016). While some software engineering platforms have attributes of an economic platform, some do not. And some platforms in the economic sense operate without a software engineering platform. To minimize confusion, I will use "platform good" or "platform market" when talking about a platform in the economic sense, and "software platform" for that sense, unless the context makes it clear which concept is being invoked.

Table 1: Examples of Platform Markets

Platform Market	Platforms	Market Participants
Electricity grids	Energy commission	Power generators, users of power
Search engines	Google, Yahoo, Bing	Users, Advertisers
Credit cards	Visa, MasterCard, American Express	Vendors, Consumers
Video games	Xbox One, Playstation 4, Wii	Users, Software Developers
Operating Systems	Windows, Mac OS X, iOS, Android	Users, Application Developers, Advertisers, Hardware Developers

39. Platform externalities allow the entity that controls the platform to maximize its profits by deciding how much to charge on each side of the platform. In many cases, this means the platform will subsidize one group, especially if that group is harder to attract or when the members of that group each add more value to the platform on a per-user basis.[12] Indeed, it is common in platform markets for one side of the market to get free use of the platform, because the extent of their presence determines the revenue that the platform owner can collect from the other side.[13] A familiar example of this phenomenon is over-the-air TV and radio, through which viewers and listeners get free media content, because the stations sell ads based directly on their ratings.

40. Platforms can be managed by public, quasi-public or private entities. For example, the electric grid is managed by quasi-public agencies balancing the output of the multiple generators of electricity with the purchases of the many users. An example of a private platform is a payment platform like Visa, which connects banks, users wishing to make purchases, and businesses wishing to collect for those purchases via debit and credit cards.

41. Platform markets arise when network externalities are present, and there are two or more sides to the market. In the case of the original telephone, the value of the phone increased as more people obtained phones and there were more people to call. That represents an externality because each additional user increased the benefit for other users, and was not compensated for creating that benefit. However, the flow of benefits was within the community of telephone users, but it was not multi-sided so the original telephone is a network but not a platform.

[12] *See, e.g.*, E. Glen Weyl, "A Price Theory of Multi-Sided Platforms," American Economic Review 100.4 (2010).

[13] Ambrus, Attila and Rossella Argenziano, "Asymmetric Networks in Two-sided Markets," American Economic Journals: Microeconomics, 1 (2009).

42. A classic example of a platform is found in the case of Microsoft DOS or Windows. In these cases, to grow and sustain the market Microsoft provided tools and APIs that with DOS created the Windows platform. These technologies made it much easier for developers to write applications. This drastically lowered the cost for DOS and Windows developers and increased the value of developer applications, and propelled the DOS and Windows operating systems into dominant market shares.[14]

43. Several Google technologies provide other examples. Google's first and most important offering is its search engine, a software product that allows users to search the World Wide Web. Google's search business is both a network good and a platform. It is a network good because as the number of users performing searches increases, users benefit (as in the telephone case) because the search engine learns what users are looking for and search results get better.[15] But more importantly to Google's business is the fact that more searches means more users for advertisers to reach. Thus, Google's search business is a platform because it brings together advertisers and the users that those advertisers target – and both advertisers and users benefit from growth in the network of users. This is different from the telephone, where the increase in value is enjoyed by telephone users, but there is no equivalent group like advertisers that accesses and benefits from the growth in that community of users. As with Microsoft DOS and Windows, the Google search platform offers tools and APIs that make it easier for advertisers to write applications and manage their side of the business.[16]

44. The strategies used by platform operators to extract value can be extremely complex. Frequently, platform owners will integrate vertically such that they are participants in their own platforms. For example, TV stations—which can be thought of as platforms that connect viewers, program producers and advertisers—frequently produce or purchase programs that then appear on their broadcast platform.[17] As discussed further below, Google through Android, can be thought of (in part) as a platform that connects phone users and app developers. However, Google has increasingly developed its own applications to run on the Android platform. This kind of vertical integration gives the platform owner additional strategies to maximize their revenue from the platform. For example, Google requires OEMs who have partnered with Google via a distribution agreement to include the Google Apps on their

[14] Marco Iansiti and Roy Levien, The Keystone Advantage, HBS Press (2004).

[15] Deposition of Urs Hoelzle, Nov. 14, 2015, page 301-02.

[16] *See, e.g.*, What is the AdWords API?, Google, https://developers.google.com/adwords/api (Last accessed Feb. 8, 2016).

[17] Evens, Tom. "Clash of TV platforms: How broadcasters and distributors build platform leadership." 25th European Regional Conference of the International Telecommunications Society (ITS) (2014).

phones.[18] This means that advertising customers who place ads in those apps can be assured of a large installed base of potential users, which may increase the revenue Google can collect for such ads.

45. Platforms can expand. As discussed further below, Google Search is a platform, which extracts revenue from advertisers by delivering to them a large number of users who come to the platform to get search results. Android extends Google's Search platform that connects phone users, phone manufacturers, app developers and advertisers. Indeed, substantial amounts of Android revenue are generated by directing search traffic to the Google Search platform. Thus, the success of Android, extends, reinforces and enhances the success of the Google Search platform.

3) Platform competition

46. Competition in platform markets is different from that of other markets. Because of the importance of size in generating network effects, it will often be the case that only a small number of competitors can ultimately survive in a given platform market.[19] And the process of self-fulfilling expectations in the growth of networks means that what happens in the early phases of market development may determine long-run outcomes.[20] To oversimplify only slightly, while all firms want to increase their customer base, for firms engaged in platform competition, this incentive is amplified by network externalities, then amplified again by the effect of today's customer base on future growth, then amplified again by the fact that growth may determine not just profitability but ultimate life or death of the firm.

47. Because of the dynamic nature of competition in platform markets, several important aspects of competition and market evolution emerge: (1) scale and tipping points or "critical mass," (2) early entry and (3) control over decisions such as pricing and compatibility. I consider each of these in turn.

[18] Hill, Brandon. *Google to Require as Many as 20 of its Apps to be Preinstalled on Android Devices*. Daily Tech (Sept. 26, 2014). http://www.dailytech.com/Google+to+Require+as+Many+as+20+of+Its+Apps+to+be+Preinstalled+on+Android+Devices/article36620 htm. Note: I understand the Android Open Source Project (AOSP) does not require applications to be included; however I understand that very few if any phone OEMs ship only with the open source version of Android. *See* Deposition Testimony of Felix Lin, Dec 14, 2015, page 85. (A. Yes. I can't think of anybody -- like I said, I can't think of anybody who just ships a phone with only Android open source and nothing else.)

[19] Evans, David S. and Richard Schmalensee, "Failure to Launch: Critical Mass in Platform Businesses," Review of Network Economics 9.4 (2010). Ambrus, Attila and Rossella Argenziano, "Asymmetric Networks in Two-sided Markets," American Economic Journals: Microeconomics, 1 (2009).

[20] Michael Katz and Carl Shapiro, Network Externalities, Competition, and Compatibility, 75 (3) The American Economic Review (1985).

a) Scale and tipping points

48. Achieving scale means attracting the critical mass of users that is required for a platform to compete effectively. As there are often fixed costs of adoption, users must either realize immediately or expect to realize sufficient benefits from joining the platform in order to choose to do so. The point at which a platform has enough users so that other users believe that the benefits from joining exceed the costs of adoption is often referred to as achieving scale or reaching a "tipping point."[21] Once a platform reaches scale it may continue to attract additional users and eventually dominate the entire market (in a winner-take-all environment), or it may remain as a viable option among a few platforms that co-exist and split the market. Ultimately, the difference between platform markets that are winner-take-all from those that have a few viable options is based on the strength of the network effects relative to how differentiated the platforms are.[22]

49. A social network like Facebook is an example of a network with particularly strong network effects where the network gains significant value with each addition of friends and family to connect with. It is also one that achieved scale early on by limiting the pool of users to single campuses, then multiple campuses, and then eventually the whole world. Early indications suggest that the on-call car service industry might be one with weaker network effects as we observe viable competition between Uber and Lyft, as well as continued (but weakened) competition from traditional taxi services. Each provides some product differentiation and benefits from network effects that provide value to users as more users join the network. But those network effects have not been so strong as to present a winner-take-all situation.

b) Early entry

50. Early entry in platform markets is important because the value of a platform will increase nonlinearly with the number of users. This means that a platform with even a small but significant user base will be much, much more valuable than a platform with no users. A late entrant is, by definition, at a disadvantage. First, late entrants will start with a smaller user base than previous entrants, making them less attractive to users both in absolute terms (as they are, in fact, smaller) and in perception (users may expect them to remain smaller because they are later). Consequently, users may be less willing to join late

[21] Evans, David S. and Richard Schmalensee, "Failure to Launch: Critical Mass in Platform Businesses," Review of Network Economics 9.4 (2010).

[22] Hagiu, Andrei. "Multi-sided platforms: From microfoundations to design and expansion strategies." Harvard Business School Strategy Unit Working Paper 09-115 (2009). See also White, Alexander and E. Glen Weyl, "Insulated Platform Competition," Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1694317, (2015); Zhu, Feng, and Marco Iansiti. "Entry into platform-based markets." Strategic Management Journal 33.1 (2012).

entrants. Second, users that have joined other platforms may face large switching costs that lock them in to their previous choices. Indeed, even if a late entrant exhibits significant superiority over early entrants in terms of price and/or product quality, it thus may only be able to attract "unattached" users, or those that have not yet joined another platform; there may not be enough of such users to achieve scale.[23] Finally, an early entrant can exacerbate these challenges and deter further entry of platforms by aggressively acquiring new users and making it more difficult for users to switch.[24] For these reasons, early entry into a platform market can be crucial to success.

c) Control of key decisions

51. Crucial to establishing scale and success for a platform is the ability to control certain key decisions, including pricing and compatibility. Platform controllers engage in price discrimination and charge different prices to different groups of users. For example, a platform may subsidize certain groups (e.g., charging below cost) and charge higher prices to others in order to increase the utilization of its platform.[25] A platform controller may also pay certain users to forgo use of competitors' platforms.[26]

52. Since the benefit that the platform product is "selling" is the network effects generated by a large user base, it is crucial that all of the users contribute effectively to that benefit. This requires compatibility, meaning that all users can interact with the platform in a consistent way.[27] Uber Technologies, Inc. is an on-call ride sharing service that matches available drivers with passengers through a mobile app. Passengers "call" cars by requesting a pickup at a given location . Once a driver picks up the passenger, the app automatically meters the ride, maps the route and completes payment through the user's stored credit card. The payment for the fare is then split between the driver and Uber. Uber has gained passenger adoption, in part, based on the consistency of the experience for both the passenger and the driver. As a passenger, I can count on virtually the same user experience, whether being picked up in San Mateo or Wellington. Uber, as a platform, ensures the consistency of the experience. This is an example of how platform owners typically use a combination of technical and contractual means to ensure compatibility on all sides of the platform. It is also worth noting in the context of my

[23] Farrell, Joseph and Paul Klemperer, "Coordination and Lock-In: Competition with Switching Costs and Network Effects," in Handbook of Industrial Organization, Vol 3.. M. Armstrong and R. Porter (eds.), North-Holland (2007).

[24] Klemperer, Paul, "Competition when Consumers have Switching Costs," Review of Economic Studies 62 (1995).

[25] E. Glen Weyl, "A Price Theory of Multi-Sided Platforms," American Economic Review 100.4 (2010).

[26] Lee, Robin, "Vertical Integration and Exclusivity in Platform and Two-Sided Markets," American Economic Review 103.7 (2013). See also Hagiu, Andrei and Robin Lee, "Exclusivity and Control," Journal of Economics and Management Strategy, 20.3 (2011).

[27] Farrell, Joseph and Garth Saloner, "Standardization, Compatibility, and Innovation," Rand Journal of Economics, 16.1 (1985).

discussion above regarding tipping points and network effects that both Uber and Lyft (an Uber competitor) provide competing platforms, and each has been able to achieve necessary scale in a market whose network effects are material but not so significant that a winner-takes-all environment has yet emerged.

B. The Java platform

53. Java was created by Sun in the early 1990s.[28] In 2010, Sun was acquired by Oracle Corporation and became Oracle America, Inc. (collectively, "Oracle"). Java is an application development platform, which includes a set of technology resources for building and running computer programs.[29] The Java platform consists of three main elements: (1) the Java computer programming language, (2) the Java Runtime Environment, which features the Java Virtual Machine, and (3) the Java Application Programming Interfaces ("Java API packages").[30] Collectively, I refer to these three elements as the Java platform.

54. The Java platform was designed to facilitate portability, meaning that programs written for one computing environment, such as a Macbook laptop, can also run on a different type of hardware, such as an HP desktop computer.[31] The Java platform provides software developers with confidence that the programs they write for a particular Java specification will work in any computing environment that contains the Java runtime environment for that specification. This concept of portability is embodied in the Java principle, "write once, run anywhere."[32]

55. In the following section I describe why the Java platform is a platform good in the economic sense, describe the growth of the Java community, and explain how Oracle monetizes Java.[33]

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[28] Oracle, Java History Timeline, http://oracle.com.edgesuite.net/timeline/java/ (last visited February 8, 2016)

[29] *New to Java Programming – Introducing the Java Platform*, Oracle (http://www.oracle.com/technetwork/topics/newtojava/intro-139083.html), accessed February 8, 2016.

[30] See JDK 5.0 Documentation, Sun, https://web.archive.org/web/20100330080522/http://java.sun.com/j2se/1.5.0/docs/index.html

[31] Nick Langley, Write Once, Run Anywhere?, Computer Weekly, May 2002 (http://www.computerweekly.com/feature/Write-once-run-anywhere).

[32] Nick Langley, Write Once, Run Anywhere?, Computer Weekly, May 2002 (http://www.computerweekly.com/feature/Write-once-run-anywhere).

[33] From here forward, I will use "Oracle" to mean Oracle and/or Sun, as the owner of Java, unless a more specific intention is explicitly mentioned.

1) Java as a "platform" in the economic sense.

56. Java is a platform good because it facilitates the seamless interaction of applications and operating systems or devices. It provides the benefit of making connections between parties who build or sell operating systems and/or devices, and parties who build or sell software applications or "apps." Apps connect to operating systems/devices to run. Device makers need to connect to apps because the availability of apps makes the devices more valuable to consumers, hence increasing device sales.

57. Positive externalities play an important role in the Java community. The value of a device increases the more apps are written for it, and the value of an app increases the more devices it can run on. The importance of these externalities to the Java platform is illustrated by the concept of "write once, run anywhere," which is seen as critical to the Java strategy.[34] The idea of "write once, run anywhere" is that a single program can be run on any machine compatible with the Java platform for which that program was written.[35] According to Professor Douglas C. Schmidt:

> Compatibility of the Java API packages is beneficial to developers since it allows them to develop applications that run without change in a wide range of operating environments (consisting of different operating systems and hardware versions), thereby simplifying the effort required to evolve their applications to meet new customer requirements and business opportunities.[36]

58. The positive externalities within the Java platform market are reinforced in many ways. [redacted]. Furthermore, just as expectations play a role in growing a new network, expectations play an important role in the survival of the Java platform. When the Java platform is expected to be successful and in demand in the future, its aspects are taught in schools and colleges, growing the network further and increasing its value.

2) Java monetization

59. Oracle monetizes the Java platform through licensing. The licensing structure is designed for Java to balance the goals of broad adoption and revenue generation. As part of this strategy, Oracle offers both

[34] *Creation of Java for Platform Independence – WORA*, Merit Campus, http://java.meritcampus.com/t/72/Creation-of-java

[35] Deposition of Donald Smith, Nov. 20, 2015, at pg. 197. ("[redacted].

[36] Expert Report of Douglas Schmidt, January 8, 2016.

commercial and open source licenses for the Java platform, and allows some categories of users to use Java free of charge, while others pay for it.

60. I understand that there are two broad categories of commercial Java licensees: one for application developers and another for companies developing devices that include the Java platform. The second category typically consists of Original Equipment Manufacturers (OEMs), and/or companies who create operating system platforms for OEMs' products.[37]

61. The first category of commercial licensees, application developers, write software programs built using the Java platform. [redacted][38] Because of Java's "write once, run anywhere" commitment, application developers know that their programs will work in the relevant Java-enabled computing environments. From an economic perspective, it makes sense to offer a license to Java app developers royalty-free, because the size and diversity of the network of Java-enabled apps creates the value of the Java ecosystem that Oracle is then able to monetize with its second category of commercial licenses.

62. [redacted].[40] I understand that there are a variety of different fee structures for royalty-bearing Java licenses, but that royalty payments generally relate to shipment volume of hardware containing the Java platform (e.g., mobile phones, e-readers, GPS systems, etc.).

63. As discussed further below, Sun and then Oracle had extended discussions with Google about licensing Java for use in Android. But instead of taking a license, Google copied the Java API packages and used them in Android, allowing Google to benefit immediately from the large community of Java developers and from the OEM and carrier ecosystem's long-established trust in Java, all without compensating Sun/Oracle.

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[37] This royalty-bearing category includes applications distributed on single-purpose dedicated hardware systems (e.g. radar systems), as opposed to general purpose desktop, laptop, and server computers..

[38] OAGOOGLE2000644741.

[39] OAGOOGLE0025585032.

[40] OAGOOGLE0025585032 .

64. As I explain above, the Java platform is a network good, the value of which increases as more developers join the community, more applications are developed for consumers in Java, and more devices use Java-based software. As one would expect, exploiting these network effects by maintaining the integrity of the Java platform ecosystem has always been an objective of Java's licensing. Oracle ensures this coherence by requiring licensees to maintain compatibility with the Java specification. Oracle's mechanism for enforcing the compatibility is a suite of technical tests known as the "Technology Compatibility Kit" or "TCK" (also sometimes referred to as the JCK). Commercial Java licensees must use and pass the TCK to ensure compliance and compatibility with the Java specifications, which is the set of technical requirements with which the developer's implementation of Java must comply.[41]

3) Java community growth and licensing successes across multiple form factors[42]

65. In this section, I summarize the historical success of Oracle's Java technology - the growth of the Java developer community, its adoption in multiple form factors over the years, its widespread licensing for use in those consumer and enterprise devices and hardware, and Sun and Oracle's continued efforts to invest in Java for its innovation and adaptation to new form factors and functionality. This is particularly important to my assessment of market harm because it proves the durability of Java's licensing revenue across form factors, and supports my findings that Oracle suffers harm in each of the markets where Android does or may compete.

66. From its launch, Java enjoyed rapid adoption. In 1997, the Java platform featured the second most popular software programming language in the world and could claim about 400,000 developers.[43] By 1998, Sun had 138 Java licensees, the JDK had been downloaded 2 million times and there were about 700,000 Java developers worldwide.[44] By 2000, the number of Java developers had grown to 2.5 million.[45] To help spur the popularity of Java and connect the Java community, Sun launched the JavaOne

[41] Java Technology Licensing Update, Java Community Process (2014), https://jcp.org/ja/press/news/licensing_update. *See also* OAGOOGLE2000179881, at -9885; *See also* https://www.jcp.org/en/resources/tdk & http://docs.oracle.com/javase/1.5.0/docs/relnotes/license.html

[42] A form factor refers to the size, configuration, or physical arrangement of a computing device. For instance, notebook computers are a form factor because they all take the same "clamshell" form, are typically rectangular or square, and open to a keyboard on the flat surface and a screen on the vertical surface. *See, e.g.*, "Form Factor," TechTarget.com, http://whatis.techtarget.com/definition/form-factor.

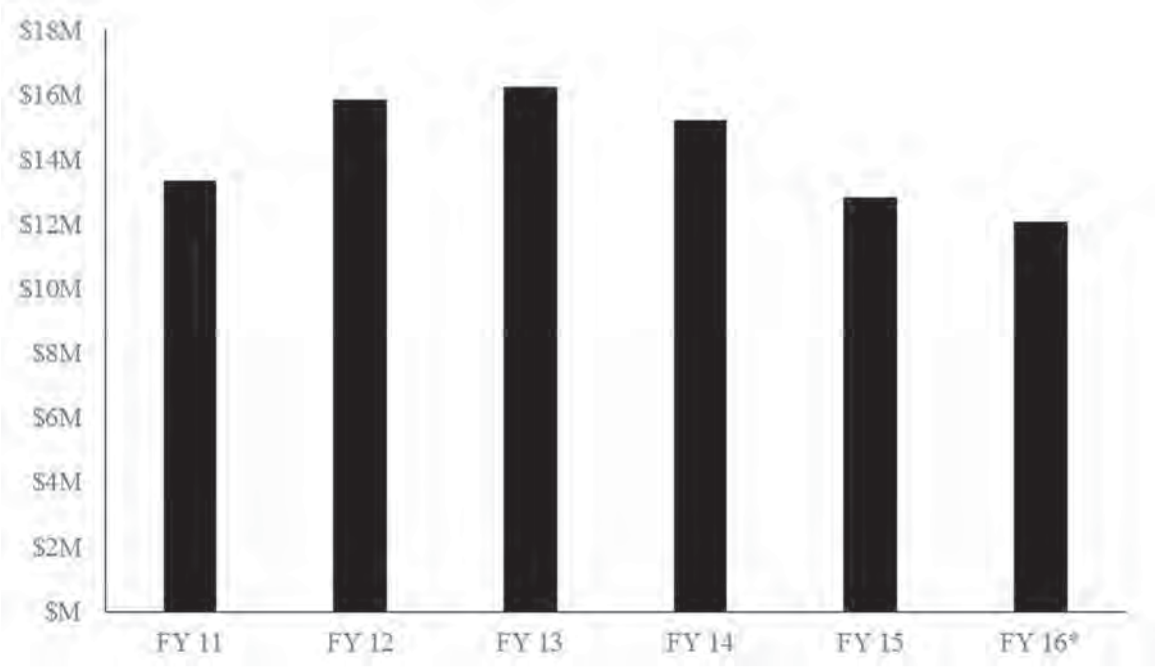
[43] Java Timeline, Java, http://oracle.com.edgesuite net/timeline/java/ (last visited February 8, 2016)

[44] Bill Petro, *JavaOne 1998- Java on the March*, http://www.billpetro.com/Publications/javaonemarch html (last visited January 22, 2016).

[45] Alan Saracevic, *Sun's Java Fest Draws 25,000*, SF Gate (June 7, 2000), http://www.sfgate.com/business/article/Sun-s-Java-fest-draws-25-000-3058399.php.

conference in 1996, with 6,000 attendees.[46] The JavaOne conference enjoyed similar growth, with 25,000 community members attending the 2000 event.[47] Figure 2 below shows Oracle's spend on Java events over time.

Figure 2: Oracle Investments in Java Events (2011-2015 and 2016 est.)[48]



67. The Java platform was integrated into many device categories. By 2000, the Java platform was powering ATMs, two-way pagers, mobile phones, personal organizers, games and game machines, cameras, industrial controllers, point-of-sale terminals, desktops, servers, and more. As technology progressed for different uses and with increased computing power, Java evolved to keep pace.[49] Figure 3 below shows examples of different companies that licensed Java over the last 20 years.

[46] Java Timeline, Java, http://oracle.com.edgesuite net/timeline/java/ (last visited February 8, 2016).

[47] Alan Saracevic, *Sun's Java Fest Draws 25,000*, SF Gate (June 7, 2000), http://www.sfgate.com/business/article/Sun-s-Java-fest-draws-25-000-3058399.php.

[48] 2015.12.16 Oracle's Supplemental Response to Google Interrogatory Response. This does not represent Oracle's complete investment, but rather is an estimate of spending on events alone.

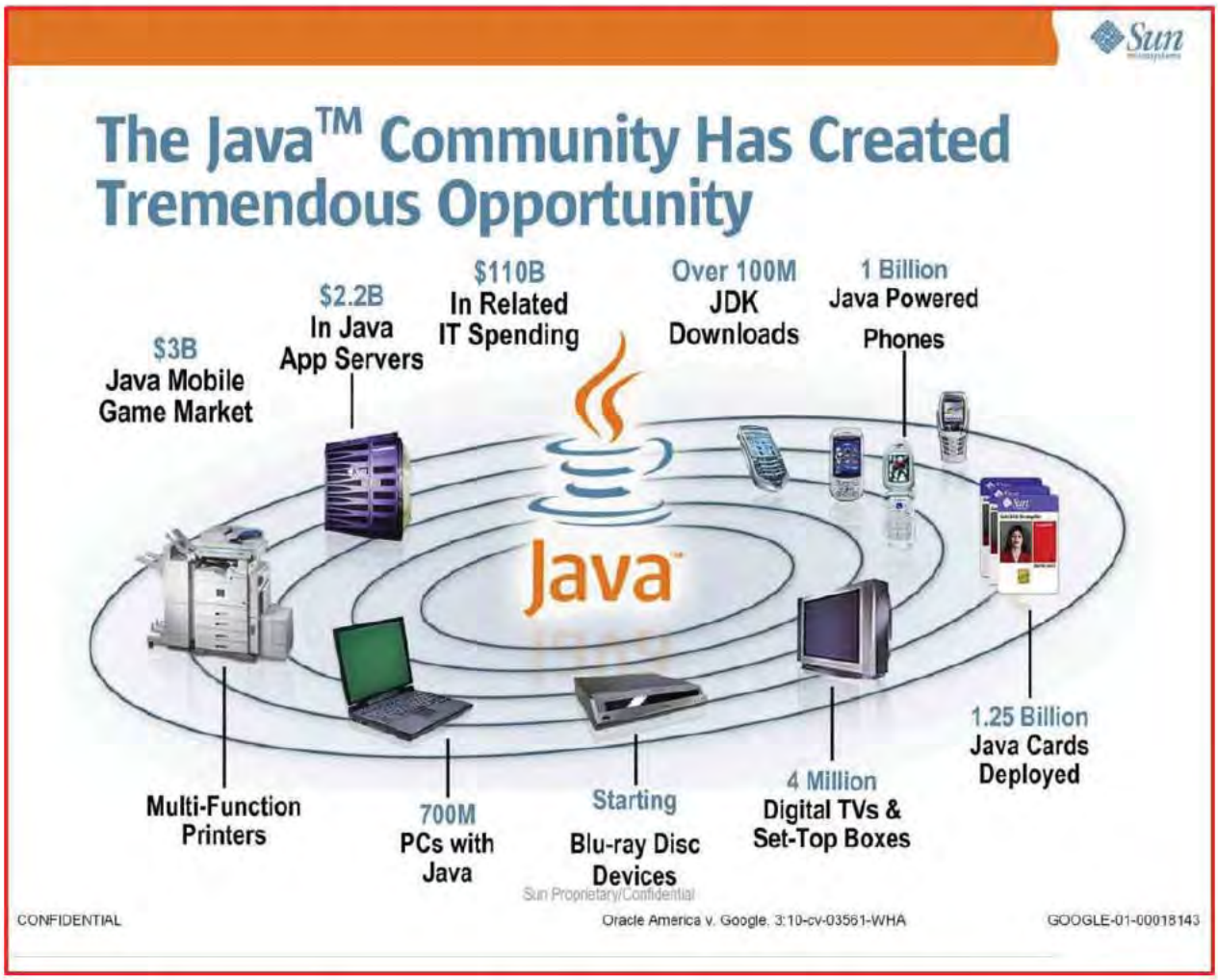
[49] GOOGLE-01-00018140, at 143; Rick Cook, Java jazzes point of sale systems with new APIs, (http://www.javaworld.com/article/2071277/java-se/java-jazzes-point-of-sale-systems-with-new-apis html) Accessed January 27, 2016. http://www.oracle.com/technetwork/systems/index-156187.html http://www-03.ibm.com/systems/z/os/zos/tools/java/; Deposition of Alan Brenner December 15, 2015 at page 59.

Figure 3: Examples of Java Device Categories over Time[50]

68. Today, Java continues to be licensed by a wide range of software and hardware developers and manufacturers. In addition to the products mentioned above, these products include e-readers, tablets, printers, smart televisions, GPS systems, vending machines, and many other computing devices. Figure 4 below, from a 2006 Sun presentation on the widespread success of the Java platform that Google obtained and had in its possession, highlights the platform's actual success and potential for further growth across many markets.

[50] See Exhibit 18 for sources.

Figure 4: Depiction of Java Community from Sun Presentation [51]



In Section IX, I discuss how many of these device categories have been affected by the events giving rise to this case.

C. Google

69. The defendant in this case is Google, a technology company that was founded by Larry Page and Sergey Brin in 1998. Google went public in 2004 and in 2015 became a wholly-owned subsidiary of Alphabet, Inc.[52]

[51] GOOGLE-01-00018140, at 143.

[52] Google, Inc. Form 10-Q For the Quarterly Period Ended September 30, 2015, p. 31

1) Google as a platform

70. Google is a platform business.[53] Google's search engine is its first and most successful product. Google's search engine provides users with relevant webpage links in response to the user entering a search query. Users do not directly pay for search results. Instead, Google generates money by selling advertising against search requests, called "queries." Google collects user data regarding search and other online behavioral preferences, which is used to improve Google products and to provide a variety of targeting options to its advertisers. Over the years, Google has introduced a number of other user-facing products and services (*e.g.*, Gmail, Maps, and Shopping). These Google products are also largely provided to users for free and funded by targeting and other advertising.

71. As a platform search and advertising business, Google serves three primary constituents: (1) users, (2) advertisers, and (3) other websites that syndicate Google search and advertising services. Google has recognized this need to balance these three different "customers" since its early days. The following excerpt from Google's S-1 offering statement describes each of the customers of Google's platform at the time of Google's IPO in 2004.

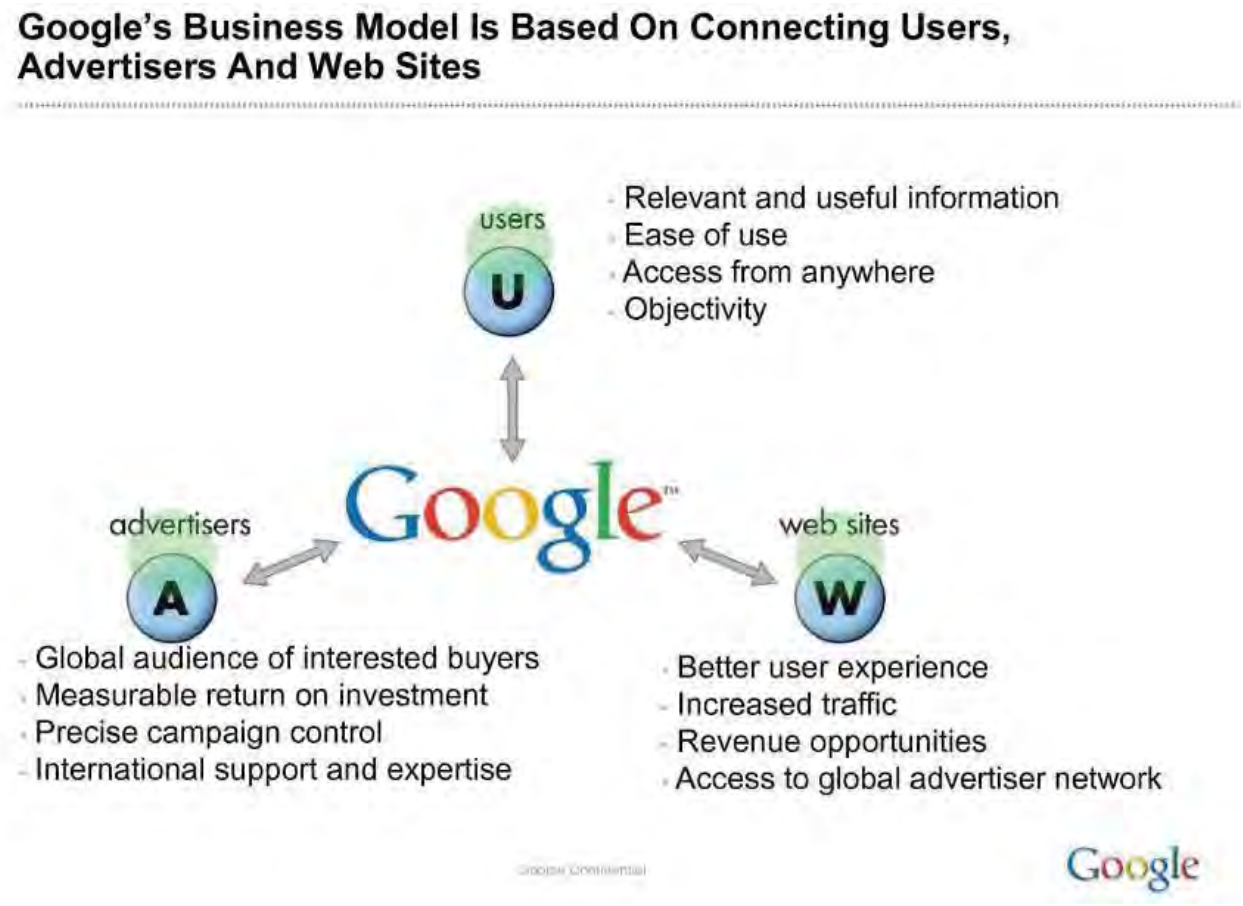
> We serve three primary constituencies:
>
> - *Users*. We provide users with products and services that enable people to more quickly and easily find, create and organize information that is useful to them.
>
> - *Advertisers*. We provide advertisers our Google AdWords program, an auction-based advertising program that enables them to deliver relevant ads targeted to search results or web content. Our AdWords program provides advertisers with a cost-effective way to deliver ads to customers across Google sites and through the Google Network.
>
> - *Web sites*. We provide members of our Google Network our Google AdSense program, which allows these members to deliver AdWords ads that are relevant to the search results or content on their web sites. We share most of the fees these ads generate with our Google Network members—creating an important revenue stream for them[54]

Similarly, Figure 5 shows a 2007 internal presentation describing how Google's platform business model is in service of these three constituencies.

[53] See generally, Google 2013 10-K.

[54] Google, Inc. SEC Filing Form S-1 (2004), at pg. 37.

Figure 5: Google's platform business model (2007)[55]



72. Serving all three of these constituent groups remains critical to Google's commercial success. Users are important because they are the "eyeballs" or audience that attracts advertisers. Web sites are important because they act as a network of billboards, extending the potential advertising space beyond that of Google-owned properties. Advertisers have a direct impact on Google's business because they collectively pay Google billions of dollars for access to the users and ad space. Google has achieved great commercial success by consistently making sure that all sides of its markets are satisfied.

2) Google's monetization model

73. Google services are not "free." The vast majority of users do not pay Google directly to use its services such as Search. Google captures its users' online behavior and then derives significant revenue from selling ads.[56] The advertisers are essentially paying for access to Google's users and for the user-targeting that is made possible through Google's data collection activities. In this way, Google was an

[55] GOOGLE-01-00025375, at 382.

[56] Google, Inc. Form 10-K, (2004-2014).

early adopter of the web-based online advertising business model, which is based on the economic principle of subsidized pricing in a platform market.[57] One group on the platform pays (advertisers) and the other group (users) does not. Google has a number of advertiser-facing products that connect advertisers with Google's audience, two of which are particularly important to understand: AdWords and AdSense.

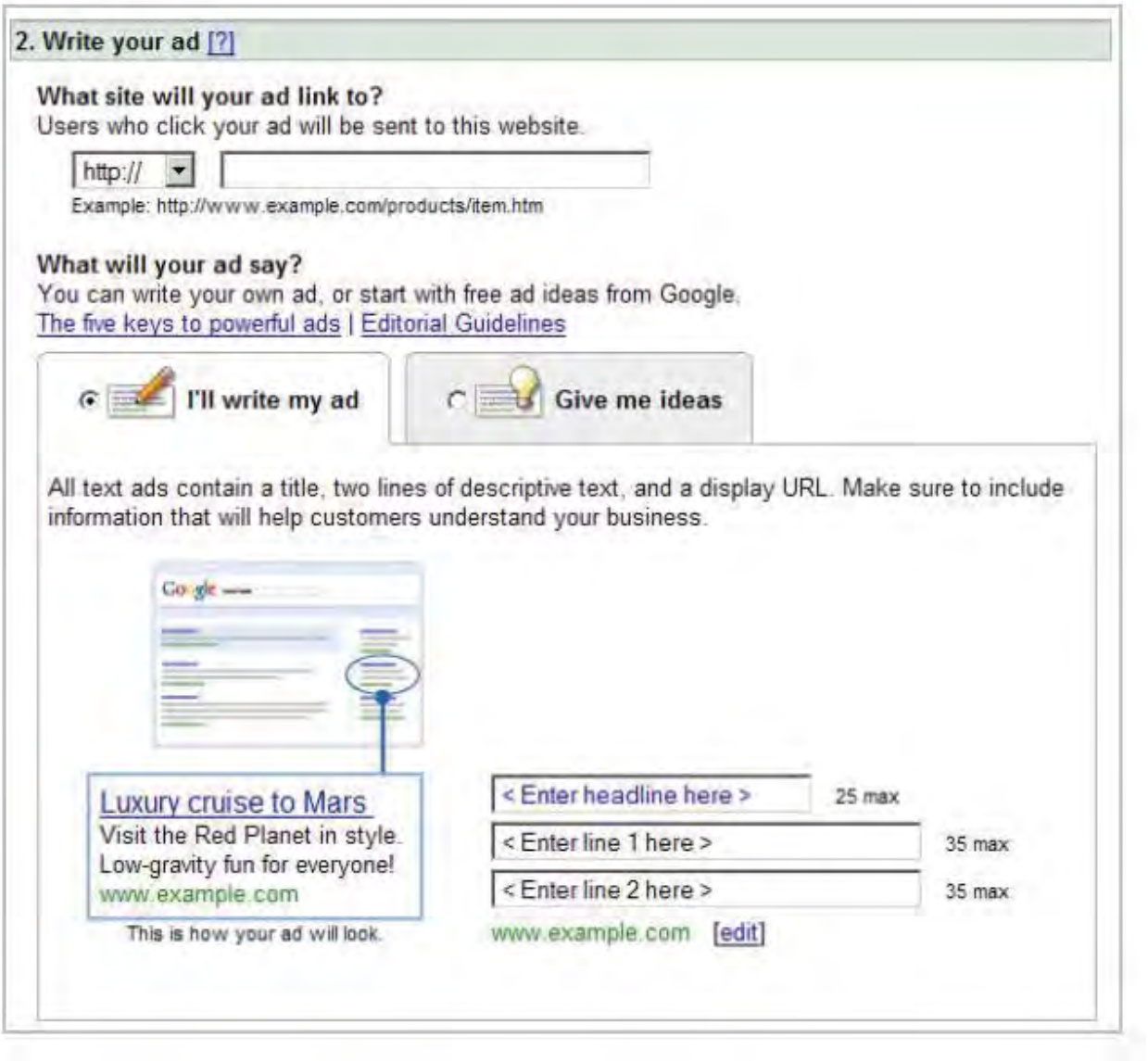
a) Google AdWords

74. Google introduced its flagship AdWords product in 2000. AdWords allows businesses to place ads alongside Google search results using a self-serve online interface.[58] Figure 5 below, taken from a Harvard Business School case about Google and its advertising business, shows an example of the advertiser interface for buying AdWords Ads in 2006.

[57] Anderson, Chris. "The Economics of Giving it Away". The Wall Street Journal. January 31, 2009. http://www.wsj.com/articles/SB123335678420235003.

[58] Google, Inc. Form S-1, p. 37

Figure 6: 2006 Google AdWords advertiser interface[59]



Advertisers can sign up for a Google account and use the online tools pictured above to buy advertisements.

75. The ads purchased through AdWords originally appeared alongside Google.com search results. Figure 6 below, reproduced from the same Harvard Business School case study, shows what AdWords ads looked like in 2006.

[59] Moon, Youngme. "Google Advertising," Harvard Business School. October 11, 2007.

Figure 7: Google AdWords advertiser interface[60]

76. Google AdWords was very successful from the start, allowing Google to become profitable in 2001.[61] Within a few years, Google had tens of thousands of advertisers–large and small--using its AdWords platform. In 2006, *The Economist* referred to Google as "the world's most valuable online advertising agency disguised as a search engine."[62] Today, there are more than 2 million publishers who use AdWords.[63]

b) Google AdSense and the Google Display Network

77. In early 2003, Google launched a complementary ad product to AdWords called AdSense. This product is targeted at owners of websites (content providers large and small), and provides them with the ability to make money from their websites. Site-owners allow Google to display relevant ads alongside their content, and Google facilitates transactions with the advertisers who wish to buy ads. Figure 8 below shows a 2006 example of an AdSense ad.

[60] Moon, Youngme. "Google Advertising," Harvard Business School. October 11, 2007.

[61] Google, Inc. Form S-1, p. 37.

[62] "The ultimate marketing machine." The Economist. July 6, 2006. http://www.economist.com/node/7138905.

[63] *About the Google Display Network*, Google, https://support.google.com/adwords/answer/2404190?hl=en (Last accessed Feb. 8, 2016).

Figure 8: AdSense example, 2006[64]

Google shares a portion of the payment from the ad-placer with the site-owner, and keeps the remaining portion of the revenue. Site-owners that use Google AdSense to serve ads on their websites are called Google Network Members.[65] As more and more companies signed up with AdSense, the reach and potential audience for Google ads increased.

78. While the users on Google's platform do not directly pay for services, they provide value to Google as an audience to which ads are served and as a rich source of data. Google uses user data for several purposes. First, search queries and click-through behavior data are used to improve Google's products, which propel the positive feedback loop of attracting more users. Second, user data plays an important role in Google's ad products. Google allows advertisers to "target" based on user information such as gender, age, and interests. Ad targeting may increase the performance and perceived value of ads, allowing Google to extract higher prices from potential advertisers.

79. Google first introduced ad targeting based on user search behavior in 2008.[66] An article in the New York Times describing the introduction of Google's search-based targeting based on searches

[64] Moon, Youngme. "Google Advertising," Harvard Business School. October 11, 2007.

[65] Google Inc., Annual Report (Form 10-K) (2004), p.21.

[66] Hansell, Saul. "Google Tests Using Your Search Data to Tailor Ads to You." The New York Times. June 26, 2008. http://bits.blogs.nytimes.com/2008/06/26/google-tests-using-your-search-data-to-tailor-ads-to-you/?_r=0.

describes the public's contemporaneous concerns about Google's use of data. Customers were unclear how Google would use the large amount of information collected about them through their use of Google products.

> A key factor in the debate is what Google, with its vast scale, does or may do with the data it has. Google controls two-thirds of the search market. It runs by far the biggest advertising network. Its DoubleClick unit is the biggest provider of ad technology to publishers and advertisers. Its toolbar is installed in many browsers, including every new Dell computer. And Google Analytics is gathering information from millions of Web sites.[67]

Privacy and Google's use of user data continues to be a prominent issue in public policy.[68]

80. Today, Google offers many different types of ad targeting which are derived from information it collects about users interacting with its products. For example, advertisers may elect to target their ads based on "interest." The Google AdWords Support website describes this as allowing advertisers to "reach people based on their interests, such as sports or travel, even when they visit a page related to a different subject on the Display Network."[69] Google also offers users the ability to control the types of ads they see on Google services.[70]

81. Google's ad products, including AdWords and AdSense have been enormously successful. Google had generated tens of billions of dollars from advertising over the years, as shown below in Figure 9.[71]

[67] Hansell, Saul. "Google Tests Using Your Search Data to Tailor Ads to You." The New York Times. June 26, 2008. http://bits.blogs nytimes.com/2008/06/26/google-tests-using-your-search-data-to-tailor-ads-to-you/?_r=0.

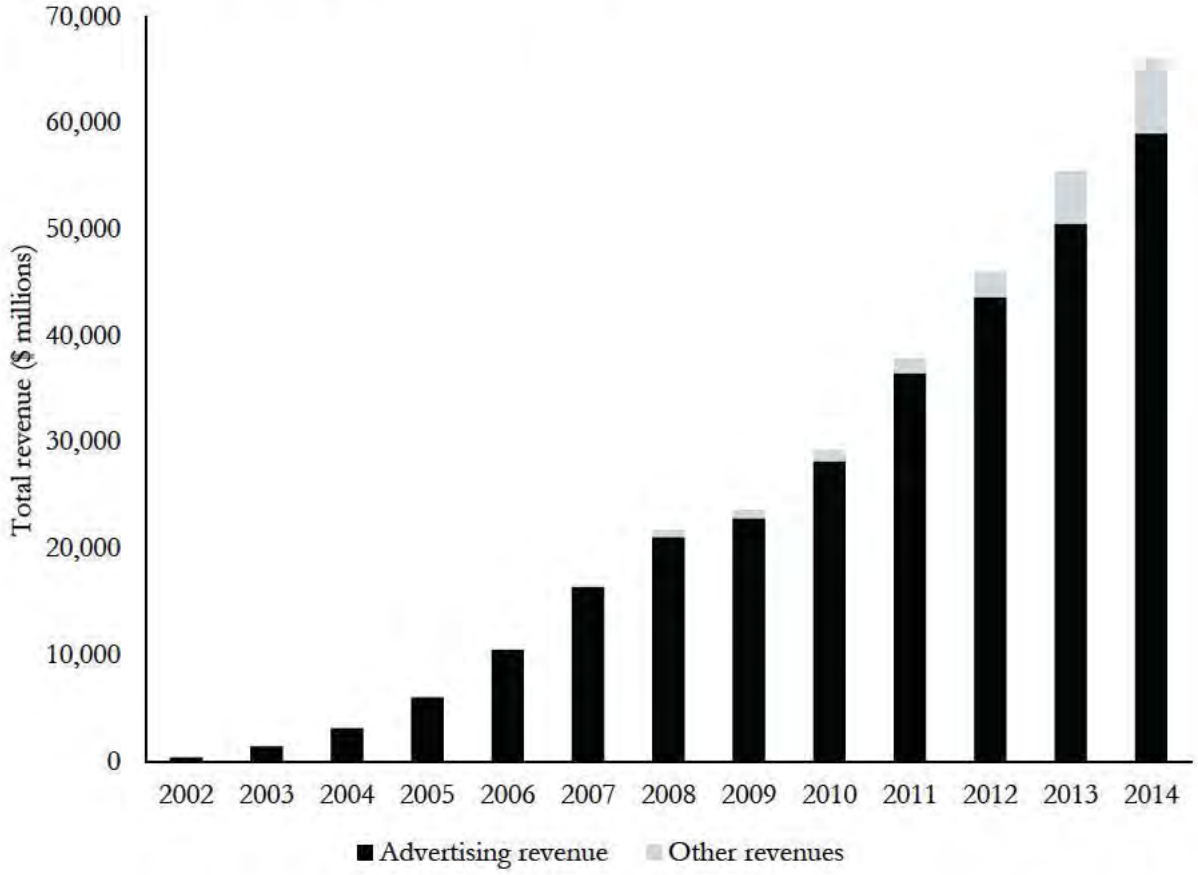
[68] Morey, Timothy, et al., "Customer Data: Designing for Transparancy and Trust". Harvard Business Review. May 2015. https://hbr.org/2015/05/customer-data-designing-for-transparency-and-trust.

[69] Reaching Your Audience on Websites, Google, https://support.google.com/adwords/answer/2404239?hl=en.

[70] "About Ads Settings." Google AdWords Support. https://support.google.com/ads/answer/2662856?hl=en.

[71] Levin, Jonathan, "The Economics of Internet Markets," *Advances in Economics and Econometrics*, Edited by D. Acemoglu, M. Arellano, and E. Dekel, 2013.

Figure 9: Google Worldwide Revenue (2002-2014)[72]



82. Google's online advertising revenues have represented between 90% and 99% of its total revenues over time, as shown in Table 2 below. The "other" Google revenue primarily consists of Google Play Store content (e.g. apps, music and movies).[73]

Table 2: Google Advertising Revenue as a Percent of Total Revenue (2002-2014)[74]

Year	Ad revenue as a % of Total Revenue
2002	94%
2003	97%
2004	99%

[72] Google, Inc., Annual Report (Form 10-K) (2004-2014).

[73] Google, Inc., Annual Report (Form 10-K) (2014), p. 25.

[74] Google, Inc., Annual Report (Form 10-K) (2004-2014).

Year	Ad revenue as a % of Total Revenue
2005	99%
2006	99%
2007	99%
2008	97%
2009	97%
2010	96%
2011	96%
2012	95%
2013	91%
2014	90%

3) Google's platform playbook

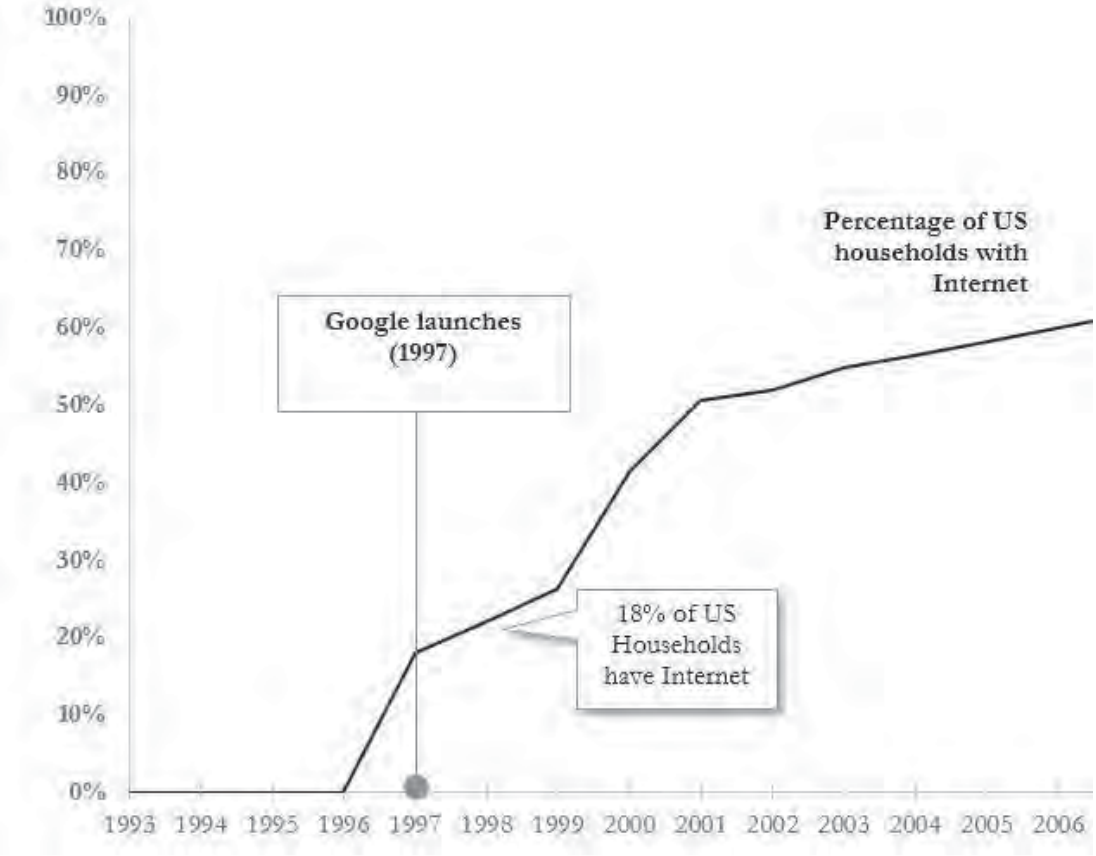
83. Google's success in PC search was based on a strategy that employed the platform economics described above – early entry, scale and control. In this section, I describe more specifically how this platform strategy enabled Google's rapid growth from 2000 to 2007.

a) Early entry and building of scale

84. When Google launched in 1997, the market for search advertising was just beginning to emerge.[75] In fact, the number of people connecting to the Internet and using computers to browse the World Wide Web was just beginning to take off. According to the International Telecommunications Union, an organization which tracks telecommunications technology adoption and use, in 1997, only 18% of US households were connected to the Internet, as shown below in Figure 10.

[75] Google registered its domain name on September 15, 1997, and the firm was incorporated on September 4, 1998. *Our History In Depth, Google*, www.google.com/about/company/history (Last visited Feb. 7, 2016).

Figure 10: Percentage of US Households with Internet (1993-2006)[76]



As the number of connected Internet users increased, search engines emerged as a way for users to find the growing body of information on the internet.[77]

85. While today Google is synonymous with internet search, in 2000, other competitors, such as Yahoo!, Ask, and AOL were all vying to capture the emerging search market. The platform nature of the search market means it is likely to sustain only a few competitors. Therefore entering early and securing a portion of the market was critical. Google's actions indicate it understood the importance of acquiring significant share early. From 2000 to 2007, Google used a strategy of rapidly securing market share (and building scale) through syndication and distribution arrangements. I describe the nature of each of these types of arrangements below.

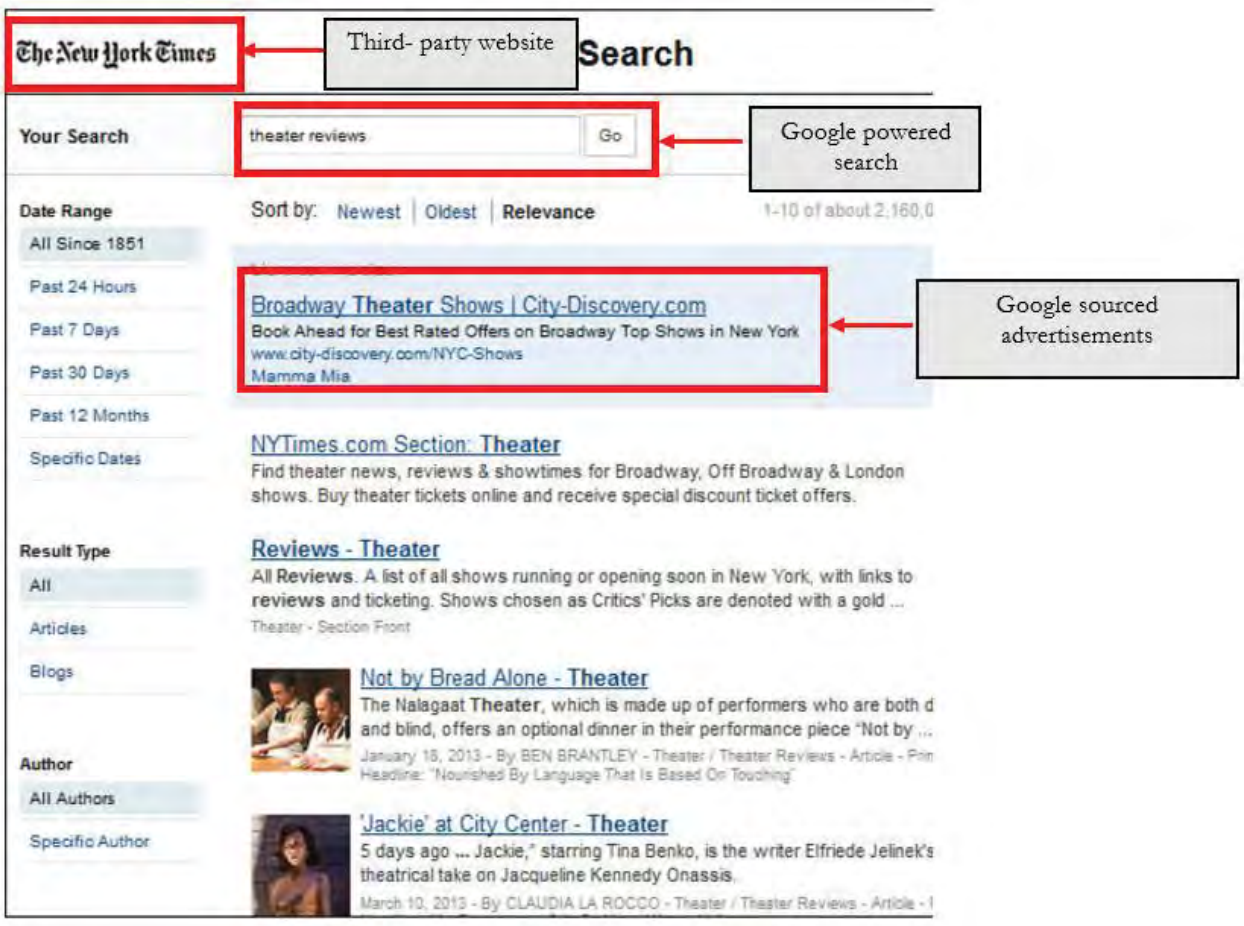
[76] ITU World Telecommunication/ICT Indicators database, 2015.

[77] Susannah Fox *Search Engines* (http://www.pewInternet.org/2002/07/03/search-engines/) retrieved February 1, 2016.

(i) Syndication

86. Google used syndication agreements with third-party web sites to build search scale. Syndication arrangements allow websites, like the NYTimes.com, to use Google's search platform technology to deploy search services and to use Google's ad network to deliver paid search advertisements along with those searches. Searches originate and results appear on the third-party website, but the results are sourced through Google's search technology.[78] Google's arrangement with the New York Times website (NYTimes.com) is an example of a syndication arrangement. As I show in Figure 11, the Times website includes a search box and search advertising, all provided by Google's search advertising platform.

Figure 11: Example of a Google Search Syndication Deal (New York Times)[79]



[78] Bertrand Bathelot, *What is Search Syndication Definition?*, The Digital Marketing Glossary (Mar. 16, 2013), http://digitalmarketing-glossary.com/What-is-Search-syndication-definition.

[79] Bertrand Bathelot, *What is Search Syndication Definition?*, The Digital Marketing Glossary (Mar. 16, 2013), http://digitalmarketing-glossary.com/What-is-Search-syndication-definition.

Syndication arrangements provide two benefits to Google. First, Google runs ads on syndicated search partners, increasing revenue and money from searches on third-party websites.[80] As a second effect, a larger volume of traffic allows Google to improve its search results, improving the effectiveness of its search and ad products searches.[81]

(ii) Distribution

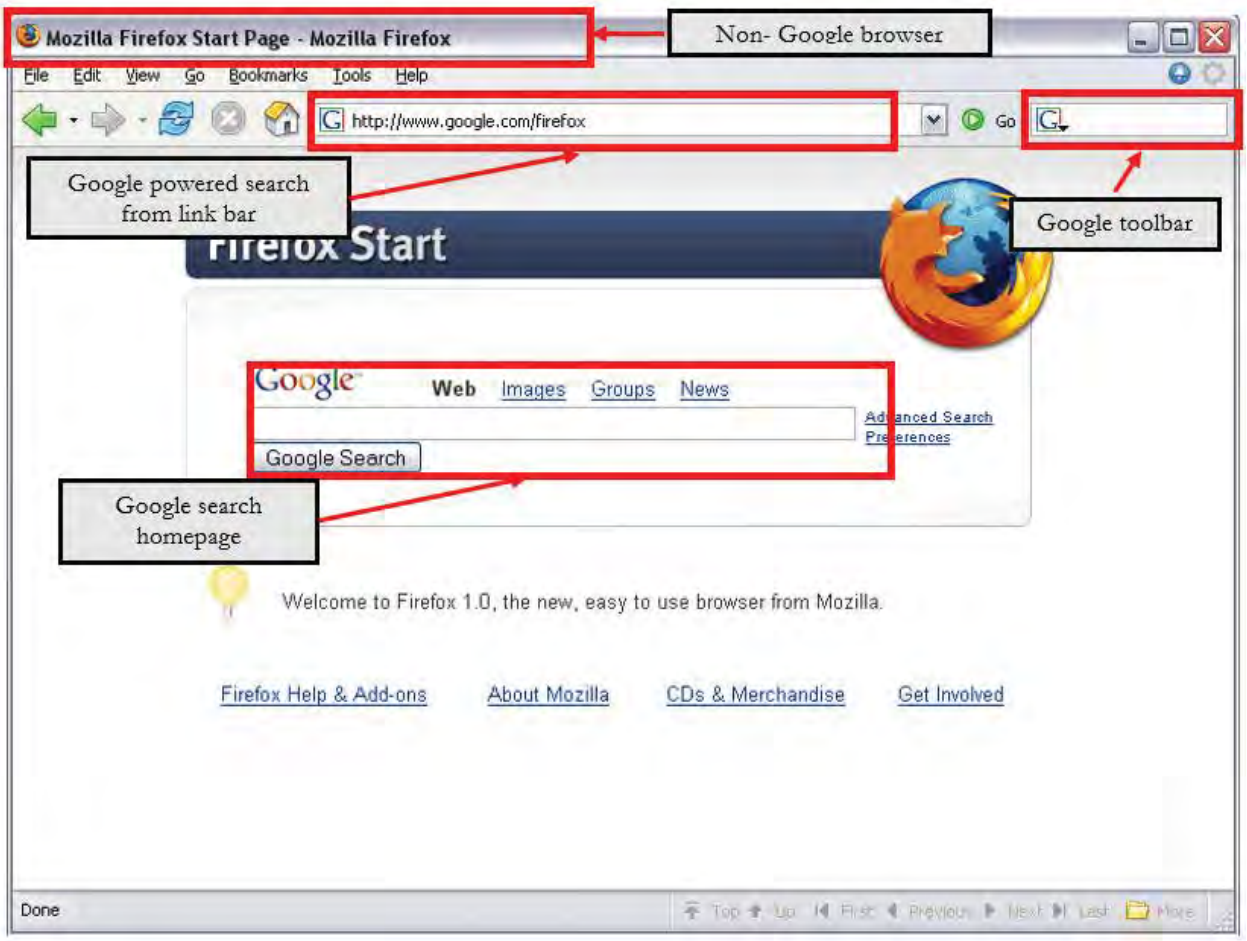
87. Distribution is an arrangement in which the partner agrees to make Google the entry point to performing searches or other services – for example toolbars, search bars in a web browser, auto-search, widgets, and/or a default homepage. When a user enters a query on a search distribution partner's technology, the results are displayed on a Google results page. Alternatively, distribution can take the form of partnerships with PC OEMs, PC retailers, software vendors, and telecom providers who agree to pre-install toolbars or establish default settings that direct users' queries to Google.[82] Google's partnership with the Firefox browser is an example of a distribution arrangement. As I show in Figure 12 below, the Firefox browser provides multiple search entry points, all powered by Google search.

[80] "We serve AdWords ads on Google properties, our syndicated search partners web sites" Google 2007 10-K page 8.

[81] Deposition of Urs Hoelzle, Nov. 24, 2015, page 301-02.

[82] Loren Baker, *Google Chrome Default Browser Coming to Dell Computers?*, Search Engine Journal (Sept. 8, 2009), http://www.searchenginejournal.com/google-chrome-dell-sony/13055/.

Figure 12: Example of a Google Distribution Arrangement (Firefox Browser)[83]



These distribution agreements were highly effective in directing traffic to Google because users typically do not change the default settings.[84] Put differently, if a laptop comes with Google set to the default search engine, the user is likely to use Google's search.[85] Distribution agreements, like syndication agreements, provide Google two-fold benefit: increased volume of search queries, and direct revenue from ads served alongside query results.

88. Table 3 below shows several examples of early Google distribution partnerships which contributed to its scale.

[83] Tim Hatch, *Mozilla Firefox Start Page*, Tim Hatch (Nov. 11, 2004), http://timhatch.com/ark/2004/11/11/mozilla-firefox-start-page.

[84] Deposition of Urs Hoelzle, Nov. 24, 2015, page 300-301.

[85] Deposition of Urs Hoelzle, Nov. 24, 2015, page 300-301.

Table 3: Selected Google Distribution and Syndication Deals

Partner	Type	Date	Terms	Importance
Yahoo![86]	Syndication	Jun. 2000	3.7m Google shares[87]	Google traffic doubled on first day of partnership[88]
AOL[89]	Syndication	May 2002	Unknown	Competitors Inktomi and Overture lost 25 to 35 percentage points of share in one week[90]
ASK[91]	Syndication	Jul. 2002	Share of $100m revenue over 3 years	Extended Google user base to millions of users on Ask
Apple[92]	Distribution (Safari default)	Jan. 2003	~ $1b p.a. ($3.20 per iOS device)	Google rapidly increased reach; Safari was downloaded over a million times in just the first two weeks of the new browser's launch.[93]
Mozilla[94]	Distribution (browser default)	Feb. 2004	~ $300m p.a.	Google was default on 2 of 3 major U.S. browsers (excluding Internet Explorer)
Dell[95]	Distribution (toolbar, homepage, desktop search)	May. 2006	~ $1b over 3 years	Dell had 30.9% of U.S. PC OEM share as of 2008[96]

[86] *Yahoo! Selects Google as its Default Search Engine Provider*, Google Press, http://googlepress.blogspot.com/2000/06/yahoo-selects-google-as-its-default.html.

[87] At Google's 2004 IPO price of $85, this is approximately $315 million.

[88] Ken Auletta, Googled: The End of the World as We Know It (2009).

[89] Renewed in 2005. Google paid $1 billion for a 5% share in AOL for this partnership. Saul Hansell, *AOL's Choice of Google Leaves Microsoft as the Outsider*, New York Times (Dec. 19, 2006), http://www nytimes.com/2005/12/19/business/media/aols-choice-of-google-leaves-microsoft-as-the-outsider.html?_r=0.

[90] David Teather, *How Google Got It So Right*, The Guardian (May 6, 2002), http://www.theguardian.com/media/2002/may/06/mondaymediasection.comment1.

[91] Ask Jeeves and Google Sign $100 Million Three-Year Deals, News from Google (July 18, 2002), http://googlepress.blogspot.com/2002/07/ask-jeeves-and-google-sign-100-million.html.

[92] Greg Sterling, *Financial Analyst Affirms Google's $1 Billion in "Default Search" Payments to Apple*, Search Engine Land (Feb. 11, 2013), http://searchengineland.com/financial-analyst-affirms-googles-1-billion-in-default-search-payments-to-apple-148255.

[93] Greg Sterling, *Financial Analyst Affirms Google's $1 Billion in "Default Search" Payments to Apple*, Search Engine Land (Feb. 11, 2013), http://searchengineland.com/financial-analyst-affirms-googles-1-billion-in-default-search-payments-to-apple-148255.

[94] Charles Arthur, As Firefox Dumps Google for Yahoo, is the Clock Ticking for Mozilla?, The Guardian (Nov. 20, 2014), http://www.theguardian.com/technology/2014/nov/20/firefox-google-yahoo-mozilla.

[95] Chris Krauter, *Google, Dell Reach Deal, Says Report*, Forbes (May 25, 2006), http://www forbes.com/2006/05/25/google-dell-0525markets15.html. Additionally, the distribution partnerships often make it difficult for consumers to remove the defaults. *See e.g.*, David Ulevitch, *Google Turns the Page, in a Bad Way*, OpenDNS Blog (May 22, 2007), https://blog.opendns.com/2007/05/22/google-turns-the-page (discussing

Partner	Type	Date	Terms	Importance
Real Networks[97]	Distribution (toolbar)	Aug. 2006	Unknown	Also bundled Mozilla browser, increasing Google's reach through both toolbar and default search
Packard Bell[98]	Distribution	Dec. 2006	Unknown	Google PC search, Google Earth, Picasa, and Google search toolbar for Firefox and Internet Explorer all preinstalled on Packard Bell computers

89. These syndication and distribution agreements helped Google win the search engine race to dominance. By 2007, Google's search technology was directly or indirectly powering 4,033,277,000 worldwide user queries. The market share these queries represented for Google in 2007 is shown below in Figure 13.[99]

the difficulty of removing preinstalled Google software from Dell laptops, even when the software may be interfering with the end users' search experiences).

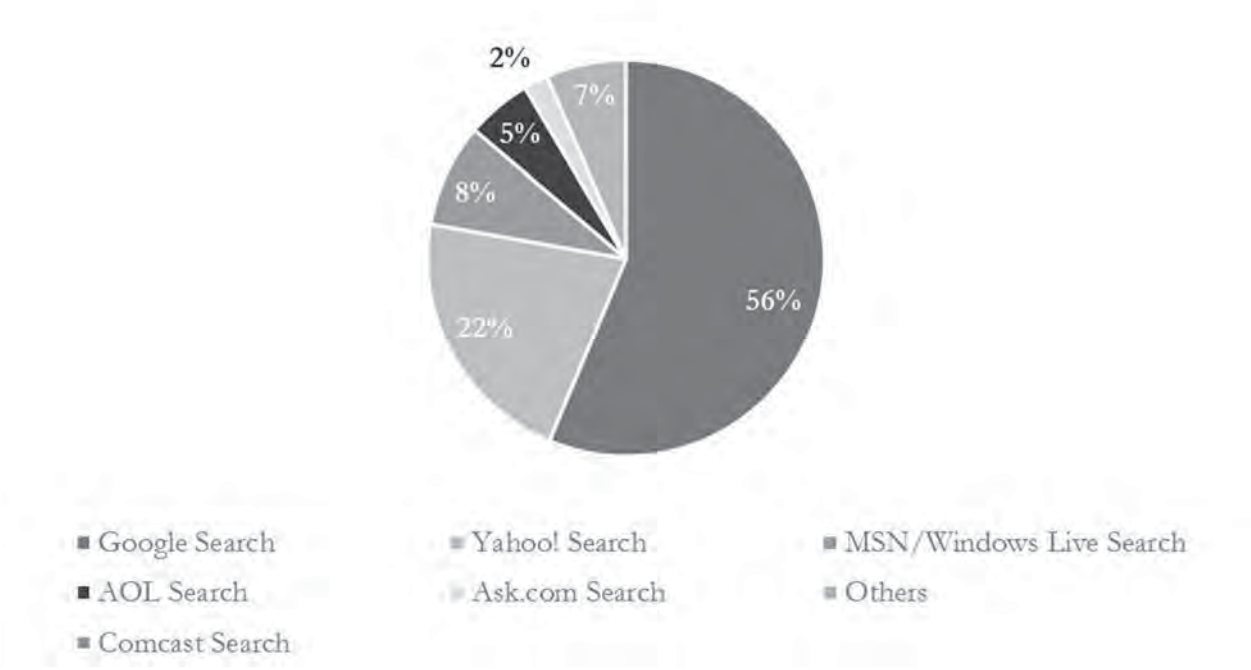
[96] Danny Sullivan, *Microsoft Wins Deal for Live Search to be Default on HP Computers*, Search Engine Land (June 2, 2008), http://searchengineland.com/microsoft-wins-deal-for-live-search-to-be-default-on-hp-computers-14117.

[97] Jennifer LeClaire, *Google, Mozilla, RealNetworks Seal Software Bundling Deal*, TechNewsWorld (Aug. 3, 2006), http://www.technewsworld.com/story/52202 html.

[98] *Packard Bell Pre-Installs Google in its PC*, Tech Radar (Dec. 4, 2006), http://www.techradar.com/us/news/software/applications/Internet/web/packard-bell-pre-installs-google-in-its-pcs-140523.

[99] *Nielsen//NetRatings MegaView Search*, (June 2007), http://www nielsen-online.com/pr/pr_070620.pdf.

Figure 13: Google's Global Search Share (2007)[100]



As I show in Figure 13, Google's search market share in 2007 was 56%, with its nearest competitor, AOL Search, at 22%.

90. Google's scale in user search queries also translated to a majority share of worldwide internet advertising revenue. By 2007, Google had one million advertisers using its ad serving platforms. [101] The syndication and distribution agreements through which Google gained scale were a significant but necessary cost, as Google repeatedly discussed in its public security filings.[102] These agreements also helped Google reach users in the mobile space, which was a concern of theirs. In 2005, Google stated a risk to their business was being "unable to attract and retain a substantial number of alternative device users to our web search services or if we are slow to develop products and technologies that are more compatible with non-PC communications devices, we will fail to capture a significant share of an increasingly important portion of the market for online services."[103] Google also faced competitive

[100] *Nielsen//NetRatings MegaView Search*, June 2007.

[101] http://bits.blogs nytimes.com//2009/01/08/google-1-million-advertisers-in-2007-more-now/

[102] Google Form 10-K, 2007, pg. 19 ("Our operating margin will also experience downward pressure if a greater percentage of our revenues comes from ads placed on our Google Network members' sites compared to revenues generated through ads placed on our own sites or if we spend a proportionately larger amount to promote the distribution of certain products, including Google Toolbar.").

[103] Google 10K 2005, p. 32.

pressures and was concerned that competitors "[could] use their experience and resources against us in a variety of competitive ways, including by making acquisitions, investing more aggressively in research and development and competing more aggressively for advertisers and web sites… we could experience a significant decline in user traffic. Any such decline in traffic could negatively affect our revenues."[104] Examining these costs over time provides insight into Google's economic motivations to shift the balance of power in their partner relationships. Google records payments to syndication and distribution partners in its financial statements as "Traffic Acquisition Cost" or "TAC." Table 4 below shows Google's TAC, as reported in its Annual Reports, from 2005 to 2014.

Table 4: Google Total Traffic Acquisition Costs (in Millions) (2008-2014)[105]

	2008	2009	2010	2011	2012	2013	2014
TAC related to AdSense arrangements	$5,284	$5,265	$6,162	$7,294	$8,791	$9,293	$9,864
TAC related to distribution arrangements	$655	$904	$1,155	$1,517	$2,165	$2,965	$3,633
Total TAC	$5,939	$6,169	$7,317	$8,811	$10,956	$12,258	$13,497

As Table 4 clearly demonstrates, TAC is a very material expense for Google, representing 23% of revenue and roughly 1/3 of Google's total costs and expenses in 2014. These Google TAC trends are particularly important to my discussion of the commerciality of Google's mobile's strategy in Section VIII.

b) Building of platform control

91. In addition to building scale through partnerships, throughout the early 2000s Google continued to build consumer products that created more opportunities to capture user attention and queries. Table 5 below lists a number of Google products that were released from 2001 to 2006.

Table 5: Google's Product Releases (2001-2006)[106]

Product	Timeframe	Description
Google Groups	Feb-01	Google Groups is a free of charge service that connects groups of people to information and people that interest them. Users can discuss topics by posting messages to a group, where other people can then read and respond.

[104] Google 10K 2005, p. 20.

[105] Google 10K 2008 p. 45; Google 10K 2011 p. 31; Google 10K 2014 p. 27.

[106] Google 10K (2004-2006)

Product	Timeframe	Description
Google Images	Jul-01	Google Image Search is a searchable index of images found across the web.
Froogle	Dec-02	Froogle is a search engine for finding products for sale online
Blogger	Feb-03	Blogger is a web-based publishing tool that lets people publish to the web instantly using weblogs, or "blogs."
Google Alerts	Aug-03	Google Alerts are email updates of the latest relevant Google results based on the user's choice of query or topic. Typical uses include monitoring a developing news story, keeping current on a competitor or industry, getting the latest on a celebrity or event, or keeping tabs on a favorite sports team. Google Alerts is now available in eight languages.
Orkut	Jan-04	Orkut enables users to search and connect to other users through networks of trusted friends. Users can create join or manage online communities, personal mailboxes, photos, and a profile.
Gmail	Apr-04	Gmail is Google's free webmail service that comes with built-in Google search technology for searching emails. In addition, Google integrated its instant messaging product into the email experience. Google serves small text ads that are relevant to messages in Gmail instead of pop-ups or untargeted banner ads.
Picasa and Picasa Web Albums	Jul-04	Picasa is a downloadable client application that helps users find, edit and share all the pictures on their computers. It streamlines the digital photography experience, allowing pictures to be transferred from digital cameras, organized, manipulated, and shared over email. Picasa's "hello" service also lets users share pictures with others and chat about them in real-time, or post them to blogs. Picasa integrates with other Google services—including Gmail, Blogger, and Froogle—and is available in 38 languages on 133 domains.
Google Books	Oct-04	Google Book Search lets users search the full text of a library-sized collection of books to discover books of interest and learn where to buy or borrow them.
Google Desktop	Oct-04	Desktop lets people perform a full-text search on the contents of their own computer, including email, files, instant messenger chats and web browser history. Users can view web pages they have visited even when they are not online. Google Desktop also includes a customizable Sidebar that include modules for weather, stock tickers, and news.
Google Scholar	Nov-04	Google Scholar provides a simple way to do a broad search for relevant scholarly literature including peer-reviewed papers, theses, books, abstracts, and articles.
Google Video	Jan-05	Google video and YouTube let users find, upload, view and share video content worldwide
Google Maps	Feb-05	Google Maps helps people navigate map information. Users can look up addresses, search for businesses, and get point-to-point driving directions—all plotted on an interactive street map or on satellite imagery. Google Maps provides a comprehensive search experience by combining yellow-pages listings with ratings and reviews and other business information. Google displays relevant targeted ads for searches done through Google Maps.
Personalized Homepage and Search	May-05	Personalized homepage gives our users a way to add information to a customized Google homepage. Personalized homepages bring together content from across the web and other Google properties, such as Gmail and Google News.

Product	Timeframe	Description
Google Earth	Jun-05	Google Earth lets users search for and browse geospatial content from community storytelling, 3D buildings, location-referenced photos and historic maps to Wikipedia articles, United Nations and European Space Agency content, and even photos and stories from *National Geographic* and videos from Discovery Networks.
Google Sketchup and Sketchup Pro	Jun-05	Google Sketchup is a free 3D modeling tool for modeling 3D buildings and can be used as a tool for populating Google Earth with architectural content. The Pro version of this tool is sold to professional designers and includes additional features.
Google News	Jan-06	Google News gathers information from thousands of news sources worldwide and presents news stories in searchable format within minutes of their publication on the web.
Google Finance	Mar-06	Google Finance provides a simple user interface to navigate complex financial information in an intuitive manner, including linking together different data sources, such as correlating stock price movements to news events.
Google Calendar	Apr-06	Google Calendar is a free online sharable calendar service that allows users to keep track of the events, appointments and special occasions in their lives and share this information with anyone they choose. In addition, websites and groups with an online presence can use Google Calendar to create public calendars, which are automatically indexed and searchable on Google. Google Calendar uses open calendar standards so the product co-operates with other calendar applications and devices.
Google Docs and Spreadsheets	Jun-06	Google Docs & Spreadsheets allows users to create, view and edit documents and spreadsheets from anywhere using a browser.
Google Checkout	Jun-06	Google Checkout enables users to shop across the web with their Google login.

The Google products described above provided benefits of scale similar to those stemming from syndication and distribution agreements. Specifically, the more time users spent on Google-owned properties, the more opportunities Google had to both gather data from those users' queries and other online behaviors, which it might use to refine and advance its ad targeting offerings. More time on Google-owned properties also provides more opportunities to serve advertising to its users and such advertising is more valuable to Google because it does not have to share the revenue with another site owner.

92. Google-owned products provide important control advantages. As described above, the ability to make key strategic decisions about pricing and compatibility is advantageous, particularly in a platform market. Furthermore, reliance on a competitor for an essential input is not an economically desirable position in any industry. In Google's case, user traffic is critically important because of its revenue model. Thus Google took steps to reduce the risk of losing traffic. For example, a syndication partner like

NYTimes.com might decide to cancel its agreement with Google, which would mean that Google would no longer get the data or ad revenue from searches on NYTimes.com. By contrast, Google-owned site traffic is completely within its own control to be monitored, monetized and protected in furtherance of its own long-term financial and strategic interests.

93. To that end, by May of 2007, Google had achieved a great deal of control over its web traffic, as Google.com became the world's most-visited website.[107] In an interview with USA Today, Eric Schmidt (at the time CEO of Google) discussed the Google playbook in a prescient and revealing summary of its business methods and objectives.

> [Interviewer:] What's your take on why Google keeps growing, while your competitors have such a hard time catching up?
>
> **[Eric Schmidt]:** We've had a very clear strategy, a very stable management team and our business approach hasn't changed very much, it's just expanded.
>
> We're playing the same game we played last year and the year before and the year before. The organization and strategy is stable, and you have the tremendous adoption of the Internet and online advertising. We've been able to run that cycle perfectly, or as perfectly as we can.
>
> We get more users, and that gets us more advertisers.
>
> More advertisers give us more cash, more cash gets us more data centers, more data centers mean we can get engineers who want to build even bigger data centers, and do more amazing computer science. Those engineers bring in their friends to build more amazing ad systems, and also work on great search.
>
> That cycle is very real at Google.[108]

As Google's Eric Schmidt's comments suggest, Google in 2007 had executed a playbook that resulted in a strongly positive feedback cycle where users led to advertising revenue, and advertising revenue lead to increased ability to invest and control the ecosystem.

[107] "Schmidt says he didn't grasp the power of Google at first," USA Today, May 16, 2007 (http://usatoday30.usatoday.com/money/industries/technology/2007-05-15-google-schmidt-qa_N.htm) accessed 1/20/2016.

[108] "Schmidt says he didn't grasp the power of Google at first," USA Today, May 16, 2007 (http://usatoday30.usatoday.com/money/industries/technology/2007-05-15-google-schmidt-qa_N.htm) accessed 1/20/2016.

94. By 2007, Google had achieved a formidable position of scale that the industry viewed as unstoppable. However, during the same period, Google was keenly aware of a looming threat to its ever-important user base - the emergence of mobile devices as an alternate means of accessing the internet.

D. The mobile ecosystem

95. This matter revolves around the technology shift to mobile devices that Sun and Google both experienced. The emergence of the Internet and its attendant economy was largely based on consumer usage of PCs.[109] In the mid-2000s, however, new telecommunication technologies and processing power began a new era, in which mobile computing would become an acceptable and ultimately preferred means of consumer and enterprise Internet access.[110]

96. In this section, I describe the key constituencies in the mobile ecosystem and the role of mobile platforms like the ones at the center of this matter. Second, I explain the key industry trends – emergence and rise of mobile, device evolution, and a shifting of dynamics among key ecosystem players. Finally, I describe the market position of Java during this paradigm shift.

1) Competitive landscape

97. The rise of mobile phones brought considerable opportunity and risk to the established leaders in the PC-based Internet economy. An emerging mobile ecosystem included the same players from the PC era – web sites and advertisers, but also introduced a new set of players to the competitive landscape. Today, we think of the mobile ecosystem as consisting of the following major groups of stakeholders: OEMs, mobile application platform providers[111], wireless carriers, and application developers. In this section, I describe these key industry participants, and explain the role of mobile application platforms in facilitating and helping control value creation.

a) Industry participants

98. A mobile applications platform is software that runs on a physical handset to run applications written for that platform (which I occasionally shorthand to "mobile platform"). Examples of mobile

[109] Barry Leiner, et. al., *Brief History of the Internet, Internet Society*, http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet (Last accessed Feb. 7, 2016).

[110] Sarah Perez, *Majority of Digital Media Consumption Now Takes Place in Digital Apps*, TechCrunch (Aug. 21, 2014), http://techcrunch.com/2014/08/21/majority-of-digital-media-consumption-now-takes-place-in-mobile-apps/.

[111] A mobile OS is typically part of mobile applications platform and a mobile applications platform is sometimes referred to colloquially as simply an OS. Mobile applications platforms also includes other platforms in specialized runtime environments.

applications platforms are: Sun's (now Oracle's) Java platform (discussed further below), Symbian OS, RIM's Blackberry, Google's Android, Apple's iOS, and Microsoft's Windows Mobile.[112]

99. OEMs produce the physical handset devices. Well-known mobile OEMs include Samsung, Motorola, HTC, Nokia, RIM, Huawei, Apple and Microsoft.[113] The devices that OEMs create (e.g., Galaxy S6, iPhone, Windows Phone) are not functional without contributions from other players in the mobile ecosystem.[114] OEMs may rely on other parties to provide the software stack that their devices run on as well as content (games, news, other apps) that users desire. OEM's all rely on wireless carriers to provide the networks that connect mobile devices - often the wireless carrier also sells the mobile phones to users.

100. Wireless carriers are the companies that supply the networks that mobile devices connect to in order to perform the most basic functions such as placing and receiving phone calls and messages (e.g. Verizon, AT&T). Mobile carriers are one channel through which users can buy phones and other mobile devices. Carriers also may have their own "media centers" that allow users to download apps such as games and ringtones. For example, Verizon Wireless opened its "Mobile Web Games and AppStore" (also called "Get it Now") in April 2009.[115] This allowed Verizon Wireless customers to download apps and games directly to their mobile device.

101. Apps are created by developers and are then distributed to users (free or for a price) on different app marketplaces for different mobile applications platforms. Some marketplaces charge an annual fee for developers, others do not (Apple charges developers $99 per year, Android charges a onetime fee of $25).[116] The marketplace provider generally takes a portion of the profits generated on its platform. Free apps are still able to generate revenues through in-app purchases and advertising. Apple, for example,

[112] *Mobile/Tablet Operating System Market Share,* NetMarketShare (Jan. 2016), https://www netmarketshare.com/operating-system-market-share.aspx?qprid=8&qpcustomd=1.

[113] *All Phone Manufacturers,* Phone Arena, http://www.phonearena.com/phones/manufacturers (last visited February 5, 2016).

[114] This is known in economics as perfect complements. Perfect complements describe two goods which must be used together, for example a physical phone is not usable without an operating system to interface between the user and the machine. *See, e.g.,* Hal R. Varian, Intermediate Microeconomics (W. W. Norton & Company, 4th ed. 1996).

[115] Verizon Wireless, http://www.verizonwireless.com/news/article/2009/04/pr2009-04-01k html (last visited December 21, 2015).

[116] Tim Mackenzie, *App store fees, percentages, and payouts: What developers need to know,* TechRepublic (May 7, 2012) http://www.techrepublic.com/blog/software-engineer/app-store-fees-percentages-and-payouts-what-developers-need-to-know.

takes 30% of revenues from apps sold in its market, leaving the developer with the remaining 70%.[117] Although these app stores take a cut of the developers' profits, they have provided developers with a market and a pool of customers that they would not have had access to.

b) Mobile applications platforms

102. Of particular interest in this case is the role of the mobile applications platform which brings together different participants in the ecosystem.

103. The value of the mobile applications platform increases as the number of users increases – specifically the value to app developers, advertisers, OEMS, and carriers. The value of the platform also increases as more developers choose to create apps for a mobile applications platform. Users enjoy more choice, and advertisers enjoy more potential impressions.[118] Availability of apps has been shown to be a key driver of user selection of a mobile device.[119]

104. Mobile applications platform providers have mobile advertising networks (similar to the search and display advertising networks described above). Advertisers pay to have ads appear on mobile devices in a variety of places. For example, ads displayed alongside search results, or ads displayed within a mobile app. As in PC online advertising, mobile advertisers prefer a large and active user base.

2) Growth of mobile industry

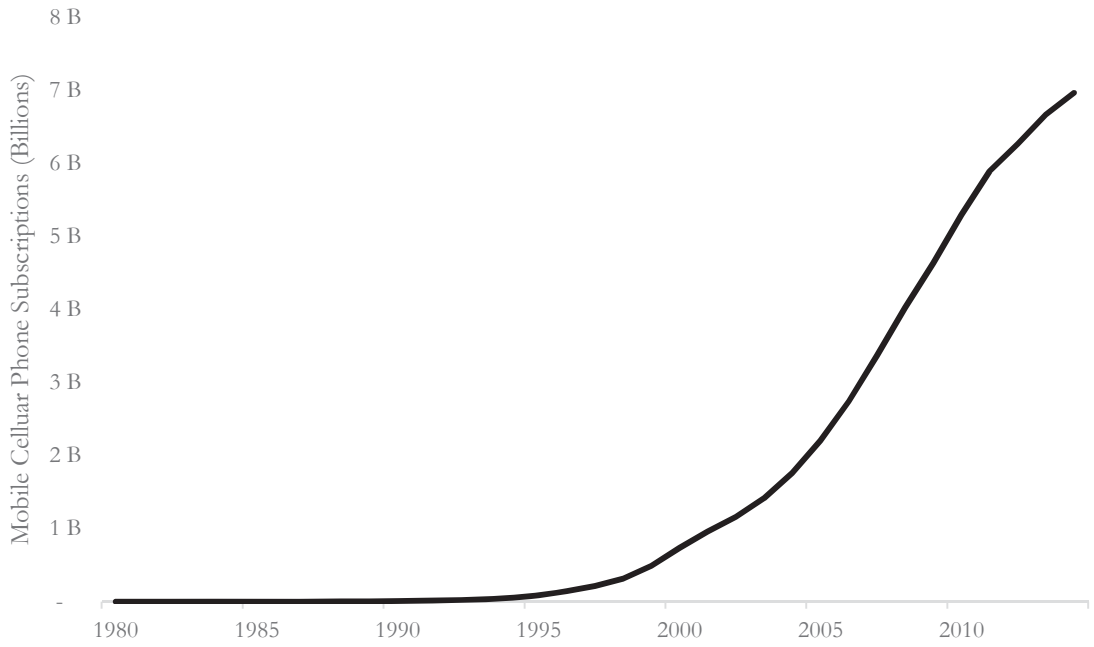
105. Beginning in the mid-1990s, cell phone technology emerged, and people started using mobile devices. Figure 14 shows the number of worldwide mobile cellular subscriptions.

[117] Tim Mackenzie, *App store fees, percentages, and payouts: What developers need to know*, TechRepublic (May 7, 2012) http://www.techrepublic.com/blog/software-engineer/app-store-fees-percentages-and-payouts-what-developers-need-to-know.

[118] Deposition of William S. Rutledge III, Dec. 9 2015, 76:15-21 ("Q: Do you know why you had an objective to increase the volume of applications in the Android market? A: My understanding of why we would want to increase the volume of apps in the Android market is to increase the market share of devices by having compelling content for those devices.") & 112:1-10 ("A: Having apps launch on Android before iPhone has been a goal of the team, you know, a secondary goal of the team for quite some time now, and it's really around driving consumer market share. So if you have compelling content that consumers enjoy on one platform versus another, then it leads to more device sales. And so finding compelling content that we could launch first by helping to build the apps faster, it helps improve our position in the ecosystem."); GOOG-00143067 ("Don't forget this is a chicken and egg game. Developers need to see volume shipments before they write apps. Apple introduced app store a year *after* they shipped devices, and thus they had momentum and volume that enticed developers. We had a problem. We launched app store without volume shipments developers could count on. . . . How do we grow the apps faster?").

[119] This was recognized by Sun, *see e.g.*, OAGOOGLE0005087637 at 641, 677.

Figure 14: Worldwide Mobile Cellular Subscriptions (1980-2014)[120]



The growth in mobile phone usage depicted in Figure 14 led to the rapid development and evolution of mobile phone devices.

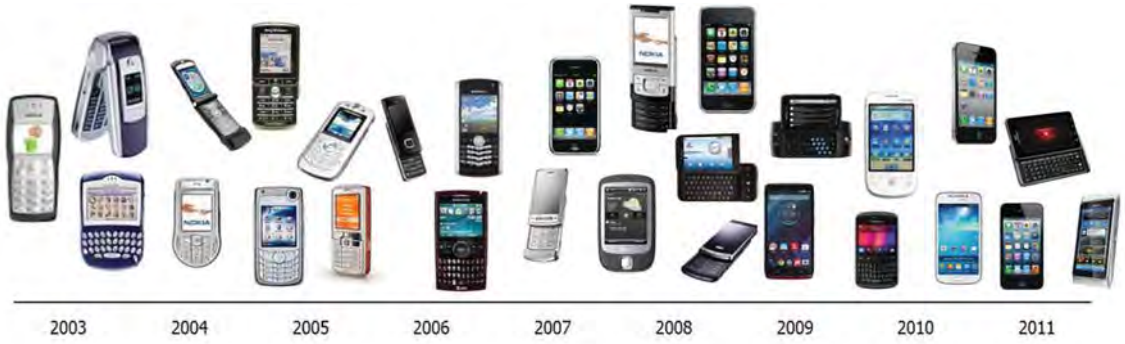
a) Mobile phone evolution

106. In these early days of mobile, the types of mobile phone available to users had different form factors and resources from those available today. While in 2016 it may be tempting to think of phones with various capabilities in strict categories like "feature phone" or "smartphone," mobile phones actually have developed on a continuum of both technical functionality and form factor.

107. Figure 15 below illustrates in pictures how mobile phone form factors changed from 2003 to 2011.

[120] Mobile cellular subscriptions. World Bank. http://data.worldbank.org/indicator/IT.CEL.SETS.

Figure 15: Continuum of Mobile Evolution[121]



108. I proceed to describe examples of mobile phones that represent key steps in this mobile phone evolution. These examples of early, highly capable phones show that mobile phone features and functionality have been evolving for a long time, and the evolution of devices is a true continuum.

109. The IBM Simon, released in 1994 illustrates the fact that phones that could do more than make calls have been around for decades.[122] The Simon featured a touch screen operated by a stylus and offered apps such as an address book, calculator, calendar, email, fax, note pad, and sketch pad.[123] Figure 16 shows a picture of the IBM Simon.

Figure 16: The IBM Simon[124]

[121] See Exhibit 19.

[122] Doug Aarmoth, *First Smartphone Turns 20: Fun Facts About Simon,* Time (August 18, 2014), time.com/3137005/first-smartphone-ibm-simon.

[123] Doug Aarmoth, *First Smartphone Turns 20: Fun Facts About Simon,* Time (August 18, 2014), time.com/3137005/first-smartphone-ibm-simon.

[124] *IBM/BellSouth Personal Communicator,* Computer History Museum, http://www.computerhistory.org/revolution/mobile-computing/18/341/1733 (last visited February 5, 2016).

110. In 1996, Nokia launched a mobile device called the 9000 Communicator. The Communicator, pictured in Figure 17 below, also had many of the features we have come to expect in a smartphone, such as email, web access, and word processing. The 9000 Communicator combined all these features with the ability to place phone calls.[125] The Nokia 9000 Communicator was sold in the United States beginning in 1997.[126] Beginning in 2000, the Nokia Communicator 9210 was running applications on the Java platform.[127]

Figure 17: The Nokia 9000 Communicator[128]

111. The Java platform was also used by smartphones created by Danger, Inc. Danger, Inc. was a company created in 2000 and is most well-known for the Java-based Hiptop, also known as the Sidekick. The Sidekick was an early smartphone and was most notable for its rapid adoption in the United States. Microsoft acquired Danger, Inc. in 2008.[129]

112. In 2001, RIM released its first BlackBerry handheld, a smartphone whose OS was based on Java. The next year RIM introduced its BlackBerry Development Environment for Java developers, who could make applications for BlackBerry devices.[130] BlackBerry has been a player in the smartphone industry since the beginning of smartphones and these devices gave both developers and users access to the Java

[125] Richard Baguley, *The Gadget We Miss: The Nokia 9000 Communicator*, Medium (April 1, 2013), https://medium.com/people-gadgets/the-gadget-we-miss-the-nokia-9000-communicator-ef8e8c7047ae#.41f1er5xo.

[126] Richard Baguley, *The Gadget We Miss: The Nokia 9000 Communicator*, Medium (April 1, 2013), https://medium.com/people-gadgets/the-gadget-we-miss-the-nokia-9000-communicator-ef8e8c7047ae#.41f1er5xo.

[127] Nokia 9210 Communicator, GSM Arena, http://www.gsmarena.com/nokia_9210_communicator-210.php (last visited February 2, 2016).

[128] *Nokia Communicator,* Wikipedia, https://en.wikipedia.org/wiki/Nokia_Communicator (last visited February 5, 2016).

[129] Erick Schonfield, *Meanwhile, Microsoft Buys Danger for $500 Million,* TechCrunch (February 11, 2008), http://techcrunch.com/2008/02/11/meanwhile-microsoft-buys-danger.

[130] Blackberry, http://www.blackberry.com/select/get_the_facts/pdfs/rim/rim_history.pdf (last visited December 21, 2015).

platform. Another BlackBerry device that used Java was the Blackberry Bold Touch 9900, pictured below in Figure 18.[131]

Figure 18: Blackberry Bold Touch 9900[132]

113. Mobile phone manufacturer HTC released the HTC Touch Pro in August 2008. The Touch Pro was Java-enabled and licensed the Java ME platform.[133] The HTC Touch Pro had a touch screen, apps, and was able to connect to the Internet.[134] Six months later in February of 2009, HTC released another phone, the HTC Dream.[135] The Dream was not Java-enabled but instead ran the Java-based Android platform which is the subject of this case.[136] Figure 19 below shows that the physical appearance of these devices was very similar.

[131] Blackberry Bold Touch 9900, GSMArena, http://www.gsmarena.com/blackberry_bold_touch_9900-3116.php.

[132] Blackberry Bold Touch 9900 Pictures, GSM Arena, http://www.gsmarena.com/blackberry_bold_touch_9900-pictures-3116.php (last visited February 5, 2016).

[133] *HTC Touch Pro*, GSM Arena, http://www.gsmarena.com/htc_touch_pro-2413.php (last visited Dec. 23, 2015).

[134] *See, e.g., User Guide, HTC Touch Pro*, Sprint, http://support.sprint.com/global/pdf/user_guides/htc/touch_pro/htc_touch_pro_ug.pdf.

[135] *HTC Dream*, GSM Arena, http://www.gsmarena.com/htc_dream-2665.php (last visited Feb. 7, 2016).

[136] *HTC Dream*, GSM Arena, http://www.gsmarena.com/htc_dream-2665.php (last visited Feb. 7, 2016).

Figure 19: HTC Dream (Java-based Android) and HTC Touch Pro (Java)[137]

HTC Dream

HTC Touch Pro

114. Along with physical resemblance, the functionality of the two HTC phones (one Java licensed, one Android) pictured in Figure 19 above is strikingly similar. The phones were very similar sizes. Both phones had messaging (SMS, MMS and email), GPS functions, cameras, and QWERTY keyboards.[138]

115. As I discuss in the next section, mobile device usage intensity, particularly with respect to the internet, increased as more powerful (less resource constrained) phones became the norm. In 2014, in the United States, the number of people accessing the internet from mobile devices was greater than from PCs.[139]

[137] *HTC Dream*, GSM Arena, http://www.gsmarena.com/htc_dream-2665.php (last visited Feb. 7, 2016); *HTC Touch Pro*, GSM Arena, http://www.gsmarena.com/htc_touch_pro-2413.php (last visited February 5, 2016); Mark Wilson, *T-Mobile G1: Full Details of the HTC Dream Android Phone*, Gizmodo (Sep. 23, 2008), http://gizmodo.com/5053264/t-mobile-g1-full-details-of-the-htc-dream-android-phone

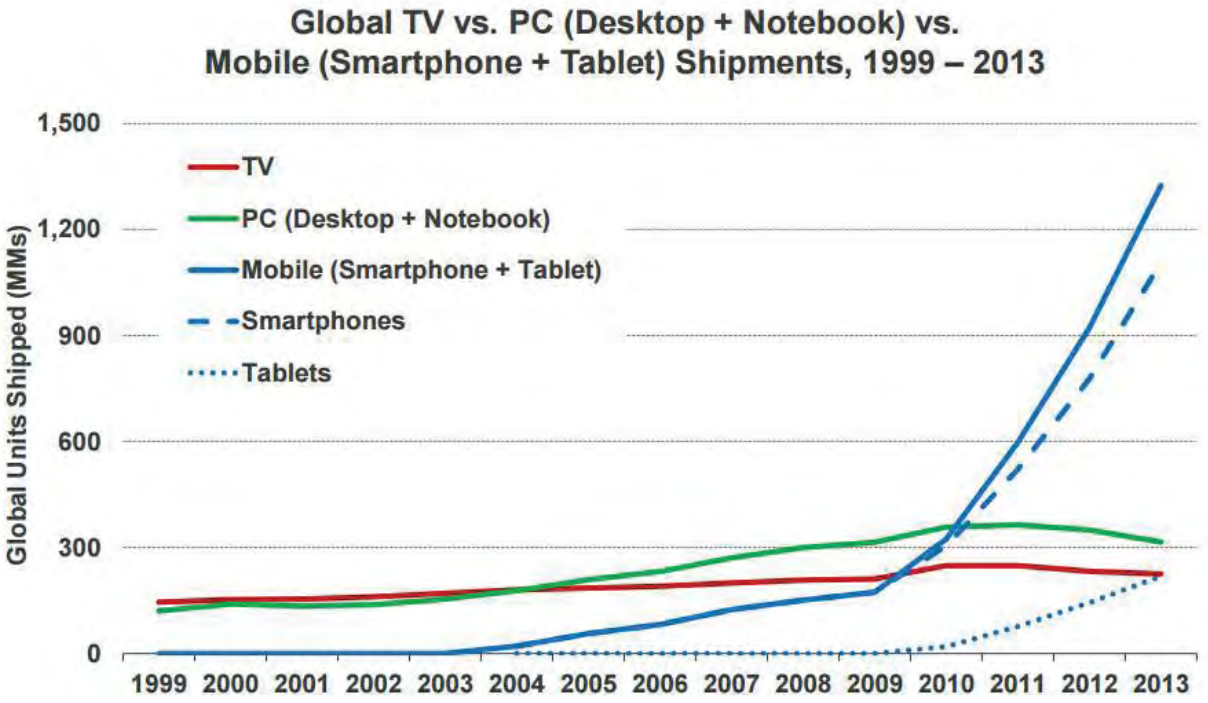
[138] *HTC Touch Pro*, GSM Arena, http://www.gsmarena.com/htc_touch_pro-2413.php (last visited February 5, 2016); Mark Wilson, *T-Mobile G1: Full Details of the HTC Dream Android Phone*, Gizmodo (Sep. 23, 2008), http://gizmodo.com/5053264/t-mobile-g1-full-details-of-the-htc-dream-android-phone.

[139] Steven Kovach, *More People are using just their phones to access the Internet than desktops*, Business Insider (Apr 30, 2015), http://www.businessinsider.com/mobile-Internet-users-pass-desktop-users-2015-4.

b) Mobile usage

116. In the mid-2000s, mobile devices had started to become a significant means by which users accessed the Internet. Figure 20 below is an excerpt from long-time industry analyst Mary Meeker's annual presentation on internet trends.

Figure 20: Global installed base of PC versus Mobile (billions of units)[140]



The chart shows the emergence and significant rise in mobile devices beginning in 2003. Mobile device shipments surpassed traditional PC shipments in 2009 and have grown rapidly ever since.[141]

c) The emergence of mobile apps

117. Mobile phones enabled many of the same tasks as PCs (productivity, entertainment, games, surfing the Internet, email, etc.), and users began to substitute mobile phones for their PCs. There was an important difference, however. Where some major Internet functions on the PC run through a browser,

[140] Meeker, Mary. Internet Trends 2014 – Code Conference. May 28, 2014. http://kpcbweb2.s3.amazonaws.com/files/85/Internet_Trends_2014_vFINAL_-_05_28_14-_PDF.pdf?1401286773.

[141] Industry analysts regularly use shipment data to track device performance.

mobile devices landed on applications (apps) as the better technological solution for accomplishing the same tasks (*e.g.*, maps applications).[142]

118. The emergence of mobile apps has created a competitive landscape to "own" user engagement on mobile devices.[143] Firms like Facebook and Yahoo!, which began on the desktop and gained significant share on PCs, sought to translate that market success to mobile device users.[144] Facebook was enormously successful - Facebook now accounts for one in every five minutes of mobile internet engagement in the U.S.[145] In addition, in the first quarter of 2015, mobile accounted for 72% of Facebook's total ad revenue at $3.32B, increasing from 59% in Q1 2014. Apps brought a new wave of "mobile-first" firms, where the user experience was designed for and primarily consumed on mobile devices. Firms like Twitter and Instagram are known as mobile first companies and have attained valuations in the billions.[146] In addition to new platforms, this app competition landscape presented a significant challenge to Google's control of mobile users' attention.

119. Today, Apple's App Store and Google's Play Store are popular and well-known app marketplaces. However, several marketplaces for Java mobile apps existed many years prior to the launch of Android.[147] For example, GetJar was an online app store launched in 2004.[148] GetJar carried apps for Java-based mobile platforms including BlackBerry and Symbian.[149] In 2008, RIM announced its

[142] Benedict Evans, *Presentation: Mobile is Eating the* World, Ben Evans, http://ben-evans.com/benedictevans/2015/6/19/presentation-mobile-is-eating-the-world.

[143] Chantal Tode, *Competition is fierce among leading brands to have the best apps*, Mobile Marketer (August 6, 2012)http://www mobilemarketer.com/cms/news/content/13461 html.

[144] Will Flanagan, *1 Out of Every 5 Minutes on a Mobile Phone is Spent on Facebook or Instagram*, ChicagoInno (Apr. 22, 2015), http://chicagoinno.streetwise.co/2015/04/22/facebook-mobile-stat-1-of-every-5-min-is-on-facebook-instagram/. See also, Facebook, Inc. Earnings Call Transcript Q1 2015, Sheryl Sandberg, COO of Facebook, states ("In the United States, for example, Facebook and Instagram get more than one out every five minutes spent on mobile.").

[145] Will Flanagan, *1 Out of Every 5 Minutes on a Mobile Phone is Spent on Facebook or Instagram*, ChicagoInno (Apr. 22, 2015), http://chicagoinno.streetwise.co/2015/04/22/facebook-mobile-stat-1-of-every-5-min-is-on-facebook-instagram/.

[146] John Koetsier, *There are Now at Least 25 billion-dollar mobile internet companies*, VentureBeat (Sept. 3, 2014), http://venturebeat.com/2014/09/03/there-are-now-at-least-25-billion-dollar-mobile-internet-companies/.

[147] Om Malik, Updated: GetJar, an early app store maker, has been acquired, GigaOm (Feb. 11, 2014), https://gigaom.com/2014/02/11/exclusive-getjar-an-early-app-store-maker-has-been-acquired/.

[148] Om Malik, Updated: GetJar, an early app store maker, has been acquired, GigaOm (Feb. 11, 2014), https://gigaom.com/2014/02/11/exclusive-getjar-an-early-app-store-maker-has-been-acquired/.

[149] Om Malik, Updated: GetJar, an early app store maker, has been acquired, GigaOm (Feb. 11, 2014), https://gigaom.com/2014/02/11/exclusive-getjar-an-early-app-store-maker-has-been-acquired/.

BlackBerry App World Store.[150] At the time, RIM licensed Java for use in its BlackBerry devices, and the apps for the App World Store were Java-based.

120. Sun also had its own app marketplace for Java apps, the "Java Store," which launched in beta in 2009. Figure 21 below from a Sun presentation about the launch of the Java Store shows an image of the consumer-facing website.[151]

Figure 21: Java Store (2009)[152]

3) Sun's mobile presence (2000-2008)

121. As the transition to mobile computing and communication began, Java continued to evolve and achieved significant adoption in the early shift to mobile computing. Sun provided the technology backbone for mobile device applications and for the major OEMs.

a) Java in mobile phones

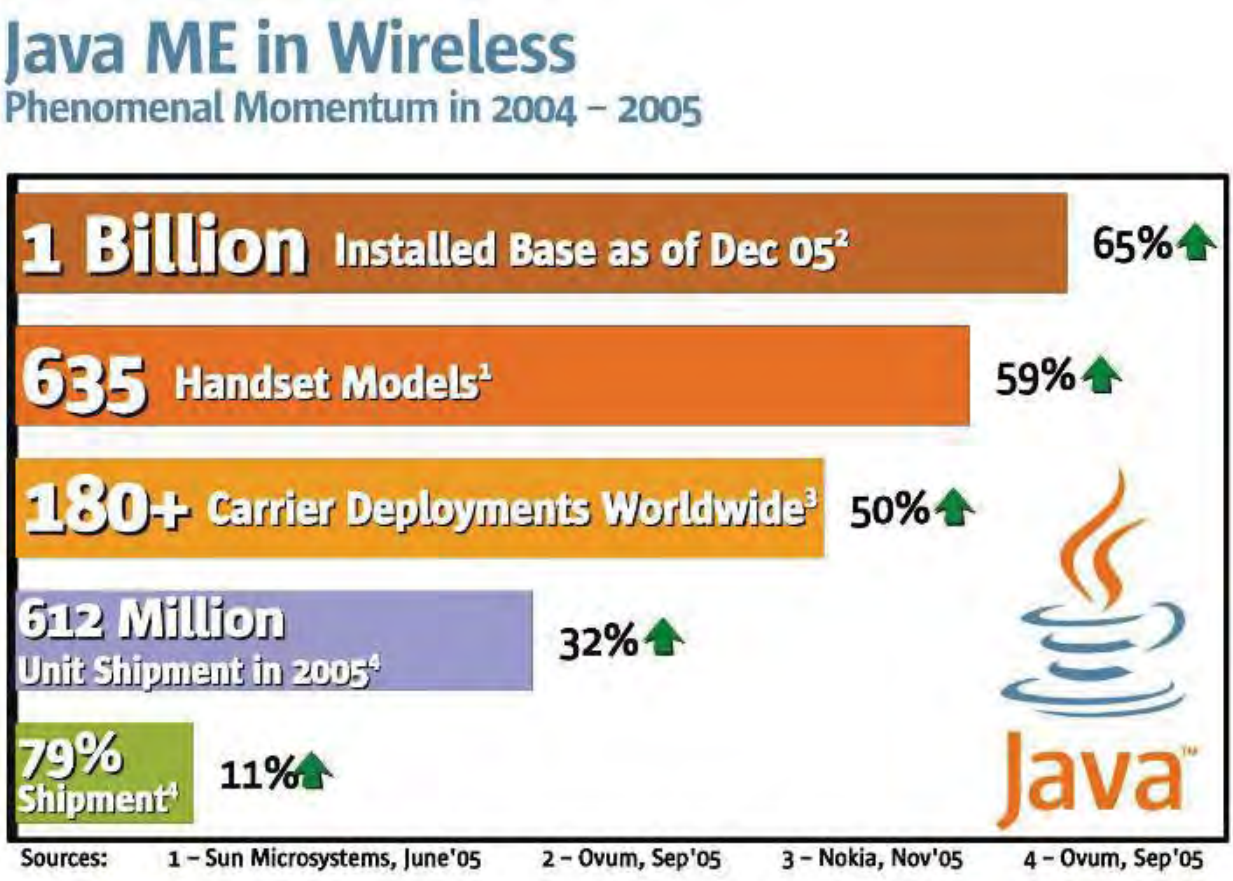
122. Sun was well-positioned to capture value from this paradigm shift. Figure 22 below is a slide from a 2006 Sun strategy document that describes the "phenomenal" early momentum of Java in wireless devices.

[150] RIM Announces BlackBerry App Store, InformationWeek (Oct. 21, 2008), http://www.informationweek.com/mobile/mobile-devices/rim-announces-blackberry-app-store/d/d-id/1073137?

[151] OAGOOGLE0001418214, at -8220.

[152] OAGOOGLE0001418214, at -8220.

Figure 22: - Java ME Overview[153]



As I discuss above, the Java ME platform referenced in Figure 22 above was Sun's first Java version designed specifically for use in mobile phones and devices.[154]

123. By 2007, Java-based phone adoption had grown to 85% of all phones shipped at the time.[155] Sun successfully monetized this widespread adoption by licensing the Java platform to OEMs and carriers, generating significant revenue. .

124. **Figure 23** below shows licensing revenue from below shows licensing revenue from Java ME from 2005 to 2010.

[153] GOOGLE-01-000181141, p. 2.

[154] *Oracle Java for Mobile and Embedded Devices,* http://www.oracle.com/technetwork/java/embedded/javame/java-mobile/overview/index html.

[155] OAGOOGLE0004260166, at 168.

Figure 23: Java ME Licensing Revenue (2005 to 2010)[156]

125. [redacted][157] The Java platform played a significant role in many of the early mobile devices.

126. [redacted][158] Symbian Ltd. was a company that was created as a joint venture between several large phone manufacturers including Nokia, Ericsson and Motorola in 1998.[159] Symbian created a mobile operating system which was based on the Java platform and licensed the software to OEMs, including the joint venture partners. By 2006 Java-based Symbian had 70% market share among phone shipments. Nokia, Sony Ericsson, Motorola, Samsung and LG were all producing phones using the Java-based Symbian OS.[160]

127. As seen in Figure 24 Java-enabled phones increased from 120 million devices in 2003 to 2.6 billion in 2008.

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[156] OAGOOGLE0100167800.

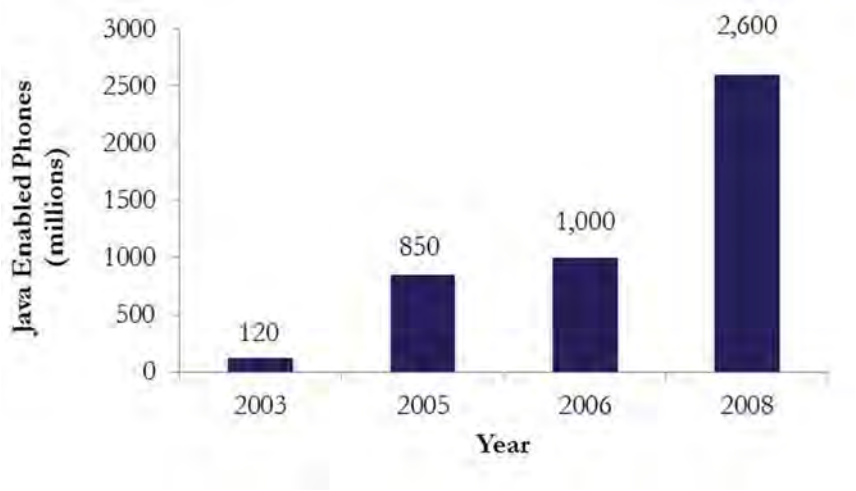
[157] OAGOOGLE2000003714.

[158] *See, e.g.*, OAGOOGLE0100167800.

[159] Natasha Lomas, *A Look Back On Symbian On The Eve Of Its Demise*, June 13, 2013 (http://techcrunch.com/2013/06/13/rip-symbian/). Retrieved February 1, 2016.

[160] Nokia, http://company.nokia.com/en/news/press-releases/2008/12/02/nokia-acquires-symbian-limited (Last visited December 21, 2015).

Figure 24: Early Java Mobile Phone Shipments (2003-2008)[161]



b) Java in Mobile Applications

128. In addition to being present on a majority of mobile devices, Java played an early role in the emerging mobile app economy. Early Java-powered applications included general publishers (*e.g.*, New York Times, Mapquest), social messaging (Yahoo! Messenger), and e-commerce (*e.g.*, eBay and Amazon).[162] Sun also operated a marketplace that allowed handset users to access games, music, maps, news, and lifestyle apps.[163] And, in keeping with its practice of extending Java into an array of form factors, Sun announced in 2007 the launch of JavaFX, "a new family of Java technology-based products designed to make it easier to build rich Web sites and Java applications across a broad range of devices."[164] In an early presentation, seen in Figure 25 below, Sun highlighted these categories as well as many of the early Java-powered apps.

[161] See Exhibit 20.

[162] GOOGLE-01-00018140, at 146.

[163] GOOGLE-01-00018140, at 147.

[164] Java Timeline, Java, http://oracle.com.edgesuite.net/timeline/java/ (last visited February 8, 2016)

Figure 25: Java Mobile Presence (2005-2006)[165]

129. In 2003, Java apps were supported by at least four major wireless carriers and their devices. AT&T provided its users access to 162 Java games and 12 Java "info" apps; Cingular supported 24 Java games; Nextel provided 113 Java games and 64 "business tools'; and Sprint gave users access to 125 Java games and 20 Java apps categorized as "non-games."[166]

4) Conclusion

130. In the mid-2000s, as user preferences evolved and smartphone adoption increased, Oracle was well-positioned to enjoy the benefits of the rapidly growing market. Sun had established itself as the leading mobile application platform. Google had established its role as the dominant PC internet search advertising firm. The rise of mobile introduced significant risk to Google's market position and the speed of user adoption of mobile phones and competitive offerings looking to capture that adoption set the firms on a course that was to become the subject of this matter.

131. In the next section, I describe the events leading to the conduct at issue, highlighting the economic, technological and market forces that influenced the behavior of Google and Oracle.

[165] GOOGLE-01-00018140, at 146.

[166] Derek Kerton & Bin Hu, Java-Wireless Application Strategies Among US Mobile Operators (2003), http://www kertongroup.com/papers/JavaAbstract.pdf.

V. GOOGLE'S CONDUCT

132. In this section, I move from the larger industry and technological trends and the histories of the players to the conduct at issue in this case. Namely, I discuss the specific situations that Sun and Google faced with the rise of mobile. It was the opportunity and challenge of this new mobile technology revolution that led the companies together and to the conduct at issue in this case.

133. In the early 2000s, Google recognized that the landscape of the Internet was changing, and that mobile was existentially significant to the future of its advertising-based business model.[167] As I describe above, the vast majority of Google's revenues came from search advertising. Google knew that if another player were to beat Google in the mobile search market, that player could undermine Google's PC search dominance and its long-term competitive position. As the use of mobile devices expanded, so did search and its attendant advertising revenue. To maintain search leadership and expand revenues, Google had to navigate a difficult and complex competitive landscape. In 2005, Google purchased Android Inc., in order to help realize its mobile strategy and fend off competition.[168] Through 2005 and 2006, key industry participants and analysts discussed the threats and opportunities presented by mobile. In 2007, the urgency with which Google needed to launch its Android platform increased significantly, with the launch of Apple's iPhone in January of that year.

134. Figure 26 below highlights key examples demonstrating the closing window of opportunity Google faced with respect to mobile.

[167] Google SEC Form 10-K (2004), at 58; GOOG-00100518-523.

[168] GOOGLE-58-00048925, at -926.

Figure 26: Google's Window of Mobile Opportunity[169]

A. Google's need to expand its mobile presence

135. By early 2005, Google acknowledged publicly that users were increasingly using their mobile devices and apps in the same ways as—and instead of—their PCs. Google's 2004 Annual Report included in its Risk Factors:

> **More individuals are using non-PC devices to access the Internet, and versions of our web search technology developed for these devices may not be widely adopted by users of these devices.**
>
> The number of people who access the Internet through devices other than personal computers, including mobile telephones, hand-held calendaring and email assistants, and television set-top devices, has increased dramatically in the past few years. The lower resolution, functionality and memory associated with alternative devices make the use of our products and services through such devices difficult. If we are unable to attract and retain a substantial number of alternative device users to our web search services or if we are slow to develop products and technologies that are more compatible with non-PC communications devices, we will fail to capture a significant share of an increasingly important portion of the market for online services.[170]

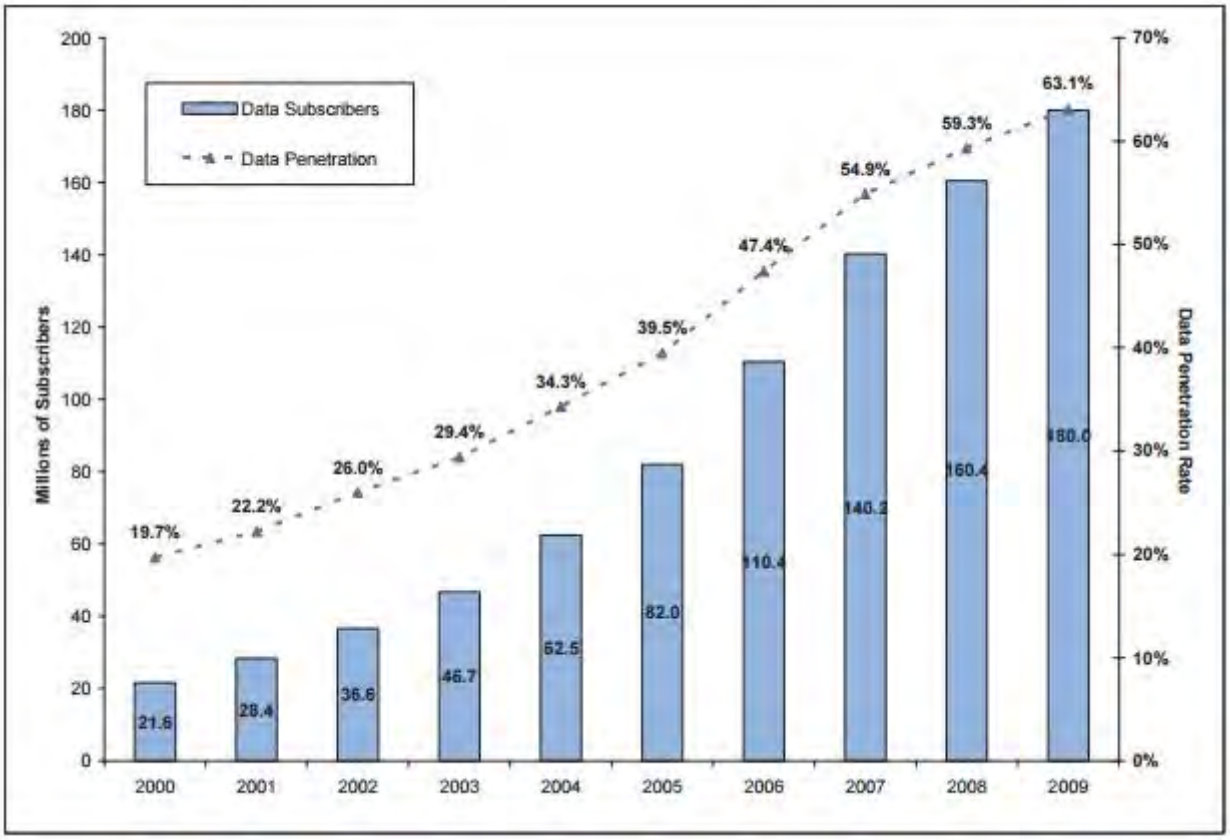
136. Google's risk statement reflects the industry trend of increasing use of mobile devices for purposes beyond phone calls, including wireless activities such as web browsing and search. By 2004, use

[169] See Exhibit 21.

[170] Google SEC Form 10-K (2004)(released in March 2005), at 58 (emphasis in original)..

of web-enabled phones was on a path of increasing growth. A 2010 study by the Federal Communications Commission pictured below in Figure 27 reflects this early trend in mobile.

Figure 27: Mobile Data Subscribers and Penetration Rates (2000-2009)[171]

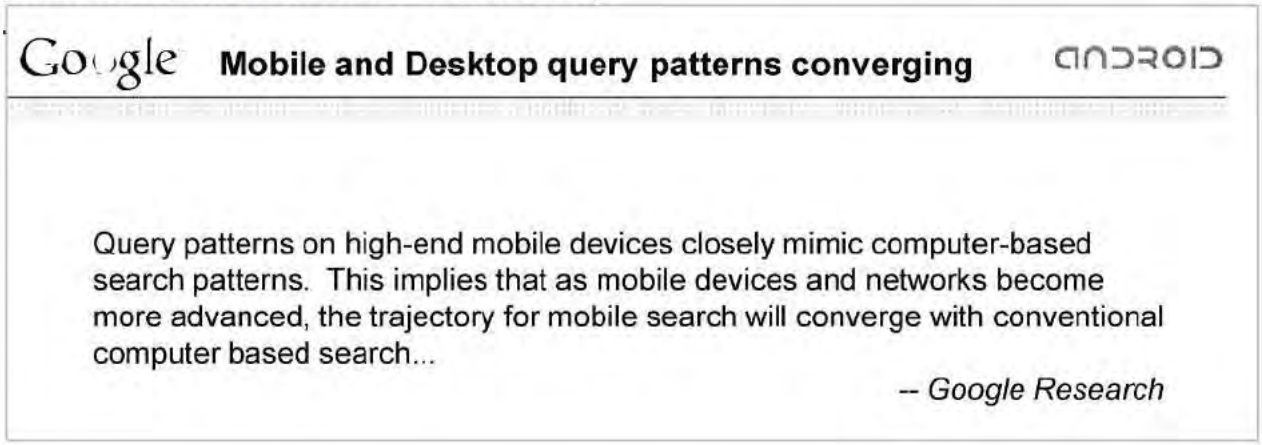


137. As you can see in Figure 27 above, mobile data subscribers in the United States increased nearly ten times from 2000 to 2009.

138. The adoption of an alternative means of accessing the web was important to Google, as it observed early on that the uses of mobile search were similar to those of PC search, the driver of its lucrative advertising business. Figure 28 below from a Google internal presentation, notes this convergence.

[171] FCC 10-81, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, Fourteenth Report, May 20, 2010, p. 95 (Data provided by Credit Suisse First Boston).

Figure 28: Google Presentation, "Android 101"[172]



139. Throughout this time period, key Google rivals Microsoft and Yahoo! were similarly focused on the mobile market.[173]

140. Yahoo! included a nearly identical risk statement to that of Google in its Annual Report in 2002: "More individuals are utilizing non-PC devices to access the Internet, and we may not be successful in developing a version of our service that will gain widespread adoption by users of such devices."[174] Like Google, as early as 2004 Yahoo! was positioning itself to capture mobile search share. Then-Chairman and CEO of Yahoo! Terry Semel expressed Yahoo!'s explicit strategy to aggressively pursue mobile users: "On the wireless side, while Yahoo! has already deployed a number of our services with the major carriers in the U.S., such as Cingular, Sprint and Verizon Wireless, we are just at the beginning. In 2005, Yahoo! will be even more aggressive to help users 'mobilize' their Yahoo! experience."[175] Semel's 2005 Letter to Shareholders touted progress in securing important mobile partnerships: "Yahoo! now has relationships with more than 50 wireless operators and device manufacturers in 26 countries including major new relationships with Cingular, Motorola and Nokia in 2005."[176]

[172] GOOG-00292191, at -2199.

[173] Google Form S-1 (2004), at 67. ("We face formidable competition in every aspect of our business, and particularly from other companies that seek to connect people with information on the web and provide them with relevant advertising. Currently, we consider our primary competitors to be Microsoft and Yahoo.")

[174] Yahoo! SEC Form 10-K (2002), at 17.

[175] Yahoo! Letter to Shareholders, Yahoo! 2004 Annual Report (2004), at 4.

[176] Yahoo! Letter to Shareholders, Yahoo! 2005 Annual Report (2005), at 4.

141. Google's other primary competitor at the time, Microsoft, was also focused on mobile, in a manner that would prove highly similar to Google's mobile platform strategy. In 2004, Microsoft described the Mobile and Embedded Devices segment in its Annual Report:

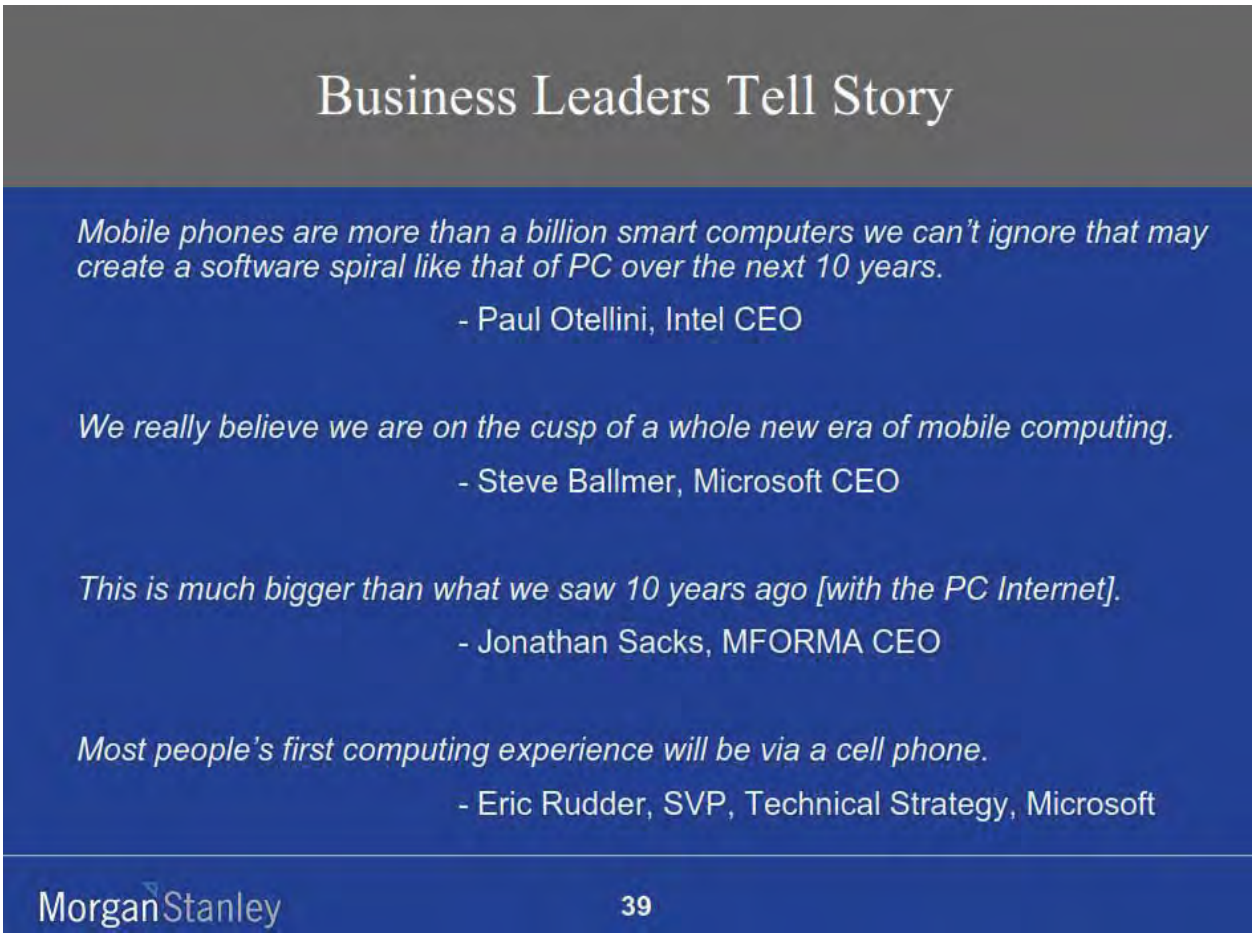
> We believe that our products compete effectively by providing a familiar development framework that enables developers to easily write and deploy innovative applications for mobile or embedded devices; providing a flexible platform that allows customers and partners to build differentiated and profitable business models.[177]

This approach would later prove to be very similar to Google's approach to building its mobile presence, and would result in a competition among platforms.

142. The technology industry was abuzz with the importance of mobile. Morgan Stanley's 2006 annual presentation on Global Internet Trends quoted several technology executives describing the importance of mobile, as shown below in Figure 29.

[177] Microsoft SEC Form 10-K (2004), at 10.

Figure 29: Business Leaders Tell Story (2006)[178]



B. The Android platform strategy

143. Against a backdrop of consumers' shifting use from desktop to mobile and key mobile industry players positioning for market dominance, Google decided to embark on building a mobile application platform that it could control. To help realize these strategic goals, Google acquired Android Inc. in 2005.[179]

144. In addition to acquiring Android Inc. and beginning to develop its mobile platform, Google began optimizing and modifying its core products and services to serve the mobile market. In June 2005, Google unveiled Mobile Web Search, an interface specially formulated for viewing search results on mobile

[178] Meeker, Mary et al. Global Internet Trends, Morgan Stanley. (April 7, 2006), at 39.

[179] *Google Buys Android for its Mobile Arsenal*, Bloomberg Business, http://www.bloomberg.com/bw/stories/2005-08-16/google-buys-android-for-its-mobile-arsenal.

phones.[180] In December 2005, Gmail for mobile launched in the United States. Over the next few years, Google optimized its successful AdSense platform for mobile[181] and continued to develop downloadable apps like Google Maps[182] and a downloadable Google iPhone app,[183] showing a commitment to translating its core advertising business to the mobile arena.

1) Android development 2005-2006

145. Android Inc. was founded by Andy Rubin in 2003 with the intention of developing an advanced application platform for mobile devices. In June 2005, Google acquired Android Inc. for a "Closing Purchase Price" of $11 million, with the possibility of an additional $60 million in milestone payments, conditioned on time-to-market and sales milestones.[184]

146. With the acquisition of Android Inc. came its engineering team led by Andy Rubin. As I discussed above, Rubin had previously started Danger, Inc., the firm that launched the Java-licensed Hiptop mobile phone. Rubin led Google's Android platform development with a "skunkworks" team of engineering, shielded away from the rest of Google.[185]

147. The Android project was, of course, strategically important to Google. The shifting technological landscape and competitive threats described above put significant pressure on the Android team to deliver a solution to market quickly. Correspondence shows the time pressure that the Android team faced to get to market quickly. In a 2005 email to Android engineer Richard Miner, Rubin states:

> It is widely believed that if an open platform is not introduced in the next few years then Microsoft will own the programmable handset platform: Palm is dying, RIM is a one-trick-pony, and while Symbian is growing market share it's becoming a Nokia only solution.[186]

The same email further detailed steps required to be successful in winning the platform battle, including Google's need to secure partnerships with carriers.

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[180] "Our history in depth," Google website, (https://www.google.com/about/company/history/)

[181] *See id*. (AdSense for mobile announced September 2007, "giving sites optimized for mobile browsers the ability to host the same ads as standard websites").

[182] *See id*. (Google Maps comes to mobile phones in the US April 2005).

[183] *See id*. (Downloadable Google iPhone app launched July 2008).

[184] GOOGLE-00303922, at -3929.

[185] Deposition of Urs Hoezle, November 24, 2015, p.56.

[186] GOOGLE-01-00019529-532 (TX 0008). See also, GOOGLE-67-00040897 ("Plan: Beat Microsoft and Symbian to volume by offering an Open Source handset solution").

> [I]t is key to get strong carrier support. While our technical leadership in search should be a huge advantage, it is considered a threat by many of the carriers. The quickest way to defuse this issue is to accelerate the advertising marketplace concept with contractual partnerships with carriers based on rev-share. Demonstrate to them the ARPU upside for our top 3 applications (search, gmail, maps/local). Model their bandwidth costs and provide to them a spreadsheet that shows them net upside. Our biggest selling point will be to show them how our advertiser network will enable them to increase data ARPU without cannibalizing existing voice revenue. The best way to do this is increase subscriber revenue through 3rd party advertisers. None of the search competitors (especially startups) have the story that Google has.[187]

148. Google's ability to incentivize partners through revenue sharing payments from advertising is significant, and was a key pillar of their pitch to carriers. Several Google presentations developed in late 2006 and early 2007 for meetings with carriers echo the strategy described in the email above. For example, a 2006 pitch presentation to Sprint describes Google's proposed partnership economics, as shown below in Figure 30.

Figure 30: Partnership Economics - Sprint presentation (2006)[188]

[redacted]

[187] GOOGLE-01-00019529, at -9530.

[188] GOOGLE-24-00206924, at -6947.73

In the 2005 Andy Rubin e-mail I referenced above, Google perceived its competitive threat to come from Microsoft. While the source of competition turned out to be misperceived, Google's need to get to market was not. Apple's introduction of the iPhone would indeed change the industry and put even more pressure on the Android team.

149. On January 9, 2007, Apple announced the iPhone. Apple's then-CEO, Steve Jobs, said "iPhone is a revolutionary and magical product that is literally five years ahead of any other mobile phone."[189] The new product announcement was incredibly well-received by users and investors alike. Apple's stock price closed at a record high on the day of the announcement. And other mobile device makers observed Apple's runaway hit.[190]

150. While the announcement came six months prior to its actual release, the hype of the iPhone continued in anticipation of the release. Before it was even on-sale, the iPhone had been the subject of 11,000 print articles and roughly 69 million search hits on Google.[191] Sentiments were that the iPhone, while not perfect, lived up to the hype preceding its release. The New York Times reported, "But even in version 1.0, the iPhone is still the most sophisticated, outlook-changing piece of electronics to come along in years. It does so many things so well, and so pleasurably, that you tend to forgive its foibles."[192] The influential Walter Mossberg of the Wall Street Journal had a similar reaction, "the iPhone is, on balance, a beautiful and breakthrough handheld computer."[193]

151. With the hype and early success of the iPhone after launch, Google had to re-think its Android efforts. Early Android team member Chris DeSalvo reacted to the iPhone release, "As a consumer I was blown away. I wanted one immediately. But as a Google engineer, I thought 'We're going to have to start over,'" Ethan Beard, an early Android business development executive remarked, "We knew that Apple was going to announce a phone. Everyone knew that. We just didn't think it would be that good."[194]

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[189] *Apple Reinvents the Phone with iPhone*, Apple (Jan. 9, 2007), http://www.apple.com/pr/library/2007/01/09Apple-Reinvents-the-Phone-with-iPhone.html.

[190] John Markoff, *Apple Introduces Innovative Cellphone*, New York Times (Jan. 10, 2007), http://www nytimes.com/2007/01/10/technology/10apple html.

[191] David Pogue, *The iPhone Matches Most of Its Hype*, New York Times (Jun. 27, 2007), http://www nytimes.com/2007/06/27/technology/circuits/27pogue html.

[192] David Pogue, *The iPhone Matches Most of Its Hype*, New York Times (Jun. 27, 2007), http://www nytimes.com/2007/06/27/technology/circuits/27pogue html.

[193] Walter Mossberg, *Testing Out the iPhone*, The Wall Street Journal (Jun. 27, 2007) http://www.wsj.com/articles/SB118289311361649057.

[194] Fred Vogelstein, *The Day Google had to 'Start Over' on Android*, The Atlantic (Dec. 18, 2013), http://www.theatlantic.com/technology/archive/2013/12/the-day-google-had-to-start-over-on-android/282479/.

152. In response to the iPhone, the Android team was forced to shift gears. They had been working on a phone, code-named the "Sooner," which looked more like a BlackBerry than the iPhone, as shown below in Figure 31.

Figure 31: Design Concept for Sooner[195]

153. After the Apple release, Andy Rubin noted, "Holy crap, I guess we're not going to ship that phone [the Sooner]."[196] Instead, the Android team shifted its efforts to developing a touchscreen phone, code-named the Dream, set to launch in 2008.[197]

154. In November 2007, Google announced Android, its application platform for mobile devices.[198] With a royalty-free licensing model and a program of incentive payments to OEMs, Google successfully

[195] GOOGLE-81-00007497, at 509.

[196] Fred Vogelstein, *The Day Google had to 'Start Over' on Android*, The Atlantic (Dec. 18, 2013), http://www.theatlantic.com/technology/archive/2013/12/the-day-google-had-to-start-over-on-android/282479/.

[197] Fred Vogelstein, *The Day Google had to 'Start Over' on Android*, The Atlantic (Dec. 18, 2013), http://www.theatlantic.com/technology/archive/2013/12/the-day-google-had-to-start-over-on-android/282479/.

recruited a number of high profile OEMs to its Open Handset Alliance ("OHA").[199] In so doing, Google Chairman and CEO Eric Schmidt stated: "Today's announcement is more ambitious than any single 'Google Phone' that the press has been speculating about over the past few weeks. Our vision is that the powerful platform we're unveiling will power thousands of different phone models."[200] Soon after, in October 2008, Google and T-Mobile launched the first Android phone, the HTC Dream (the device featured above in Figure 31).[201] Along with the product launch, Google also announced an Android app store.[202]

2) Android business strategy

155. Google had a four-phase strategy designed to protect Google's search business by building and controlling the ecosystem of the (then) future mobile market. Figure 32 below from a July 2010 Android presentation to Google's Operating Committee lays out the Android roadmap.

[198] Google simultaneously announced the formation of the Open Handset Alliance ("OHA"). The OHA began as a group of thirty-four companies in the mobile space including Google, T-Mobile, HTC, Qualcomm, Motorola, Sony, and Samsung. *Industry Leaders Announce Open Platform for Mobile Devices*, Open Handset Alliance (Nov. 5, 2007), http://www.openhandsetalliance.com/press_110507 html.

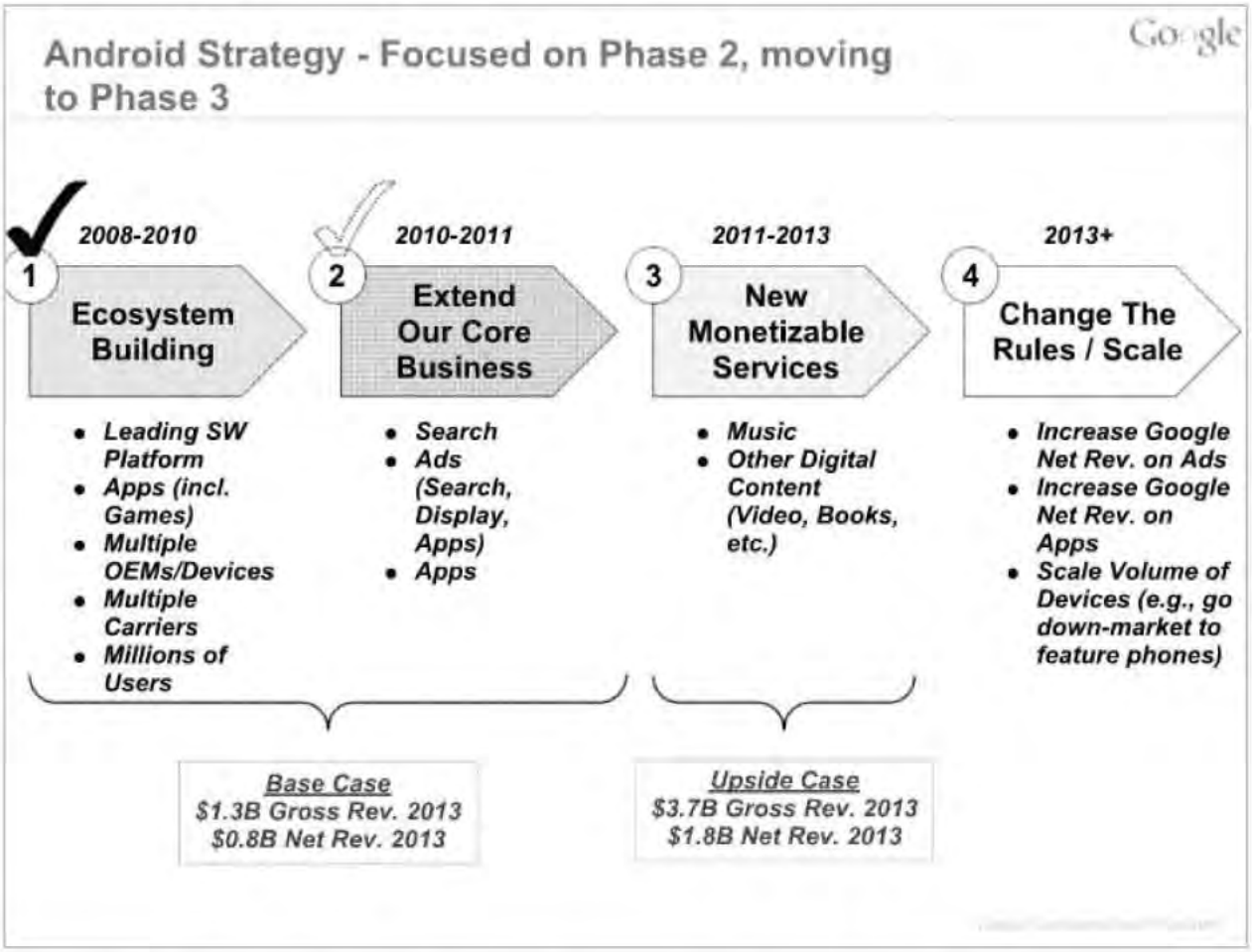
[199] *Industry Leaders Announce Open Platform for Mobile Devices*, Open Handset Alliance (Nov. 5, 2007), http://www.openhandsetalliance.com/press_110507.html.

[200] *Industry Leaders Announce Open Platform for Mobile Devices*, Open Handset Alliance (Nov. 5, 2007), http://www.openhandsetalliance.com/press_110507.html.

[201] Kent German, *A Brief History of Android Phones*, Cnet (Aug. 2, 2011), http://www.cnet.com/news/a-brief-history-of-android-phones/.

[202] Mark Wilson, *T-Mobile G1: Full Details of the HTC Dream Android Phone*, Gizmodo (Sept. 23, 2008), http://gizmodo.com/5053264/t-mobile-g1-full-details-of-the-htc-dream-android-phone. The original Android App store is now known as the "Google Play Store."

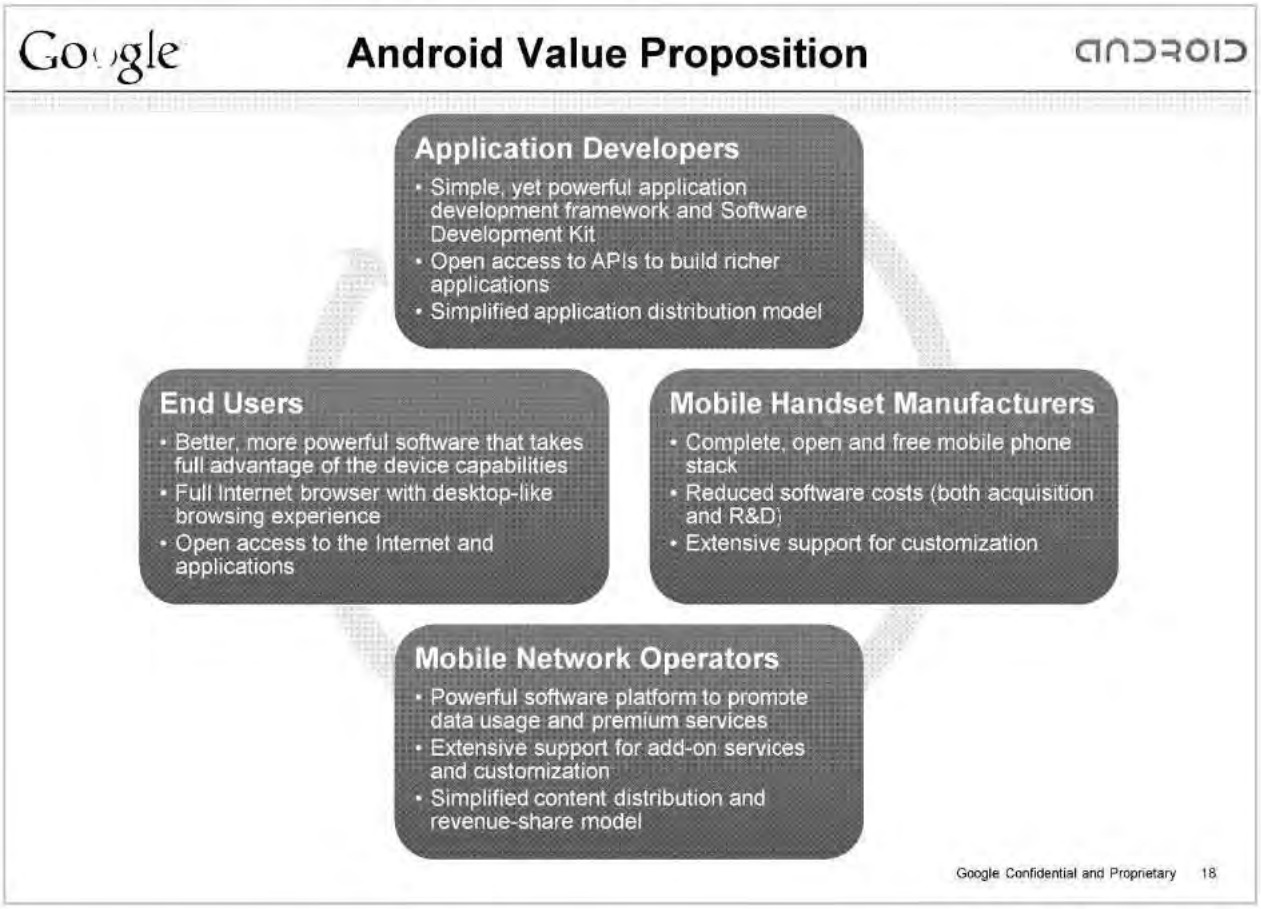
Figure 32: Android Four Phase Strategy[203]



156. The first phase, "Ecosystem Building," required that Google quickly create a "Leading SW [Software] Platform." Google understood that Android would deliver value to a number of platform constituents, as shown below in Figure 33.

[203] TX 1061.

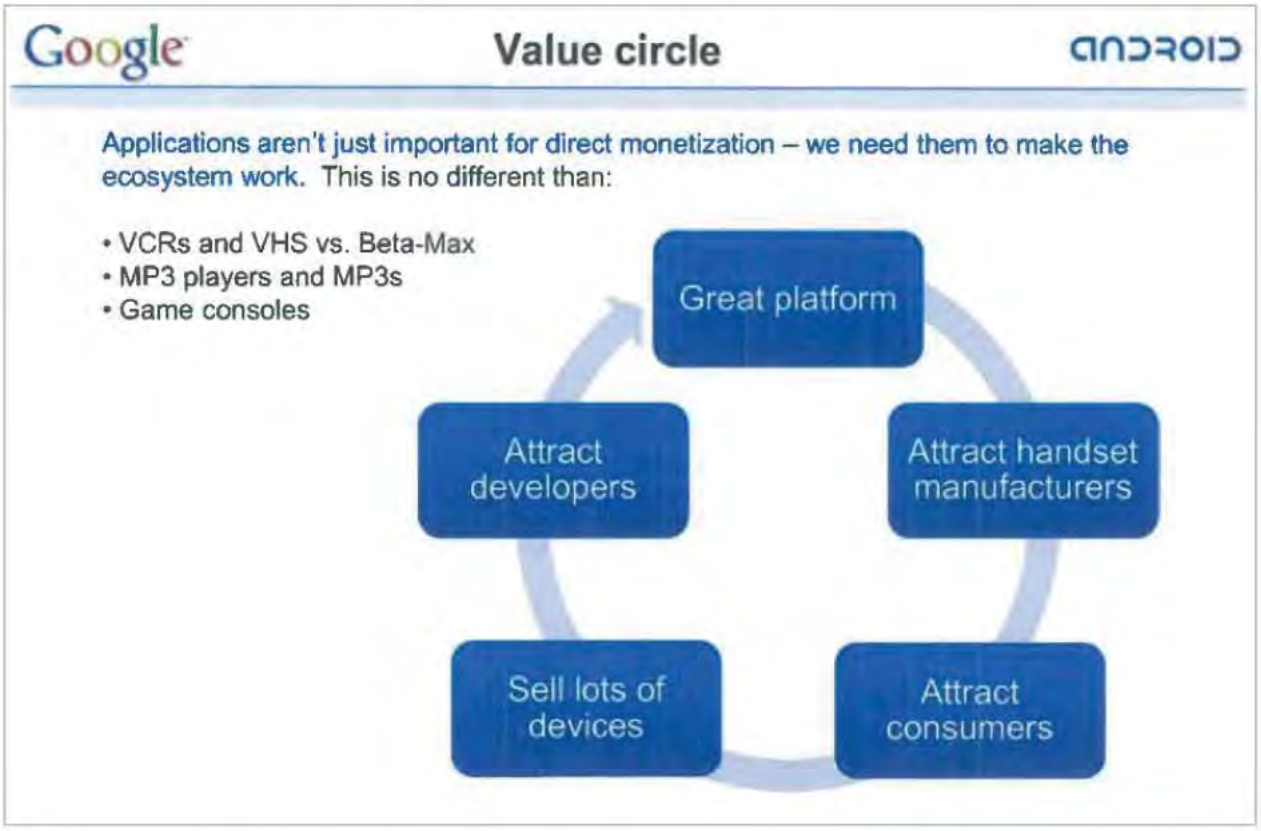
Figure 33: Android Value Proposition (2010)[204]



157. Google realized that establishing this platform would create a positive feedback loop, or "Value Circle," as shown below in Figure 34.

[204] TX 31 (GOOGLE-00298438, at -8455).

Figure 34: Android "Value circle" (2010)[205]



158. Google's desire to build a mobile app developer community led it to the Java platform. Google's vision for how Android would reach this position in the mobile ecosystem was summarized in a 2009 strategy presentation, where the vision for Android was stated as, "Give it away for free, and aggressively build a **developer ecosystem to drive innovation and platform adoption.**"[206] A contemporaneous Verizon ad for an Android phone, in Figure 35 below, shows just how important the app ecosystem was to Google's value proposition to users.

[205] GOOGLE-22-00060007, at -039.

[206] GOOGLE-22-00060007, at -015 (emphasis in original).

Figure 35: Verizon Ad for Android Phone (2010)[207]

C. Google copies Java API packages without a license or permission

159. Between 2005 and 2009, Sun and Google were in discussions over a license agreement for Google to use the Java platform in Android.[208] The first round of discussions was known as "Project

[207] GOOG-00109204.

[208] GOOGLE-12-00000544, at -0544-45 (Negotiations started in August 2005 when Andrew Rubin emails Leo Cizek, Google Account Manager at Sun, to work on Android together). OAGOOGLE0000150908 ("I also explained

Armstrong" and took place from August 2005 to May 2006.[209] The second series of discussions occurred in the Fall of 2008, then again in the Spring of 2009, and then again after Oracle acquired Sun in 2010.[210] I understand that an agreement was not reached.

160. After the first set of negotiations with Sun did not result in an agreement, Google chose to copy Sun's Java API packages anyway, and to launch the Android mobile application platform based on those copied Java API packages. I understand that all commercially released versions of Android contain the 37 APIs copied from Java.[211] More specifically as to those 37 Java API packages, Google copied the API declaring code verbatim. This copying included not only the code itself, but also the structure, sequence and organization of the components of the 37 API packages.[212]

161. Google's choice of Java was driven by many of the concerns inherent in platform economics. For example, Java had an established ecosystem which includes the following attributes: (1) widespread acceptance among vital platform partners like OEMs and wireless carriers[213]; (2) a familiar, well-tested applications platform that ran predictably on numerous accepted systems[214]; (3) a stable, educated, deep-rooted developer community with millions of members who were ready and able to develop rich apps[215]; and (4) the ability to reach market faster with a technically stable, lower-risk commercially successful product.[216]

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that if they choose the commercial use/compatible option, it would have ramifications throughout Google, and I gave Android as an example.").

[209] GOOGLE-12-00000544, at -0544-45 (Negotiations started in August 2005 when Andrew Rubin emails Leo Cizek, Google Account Manager at Sun, to work on Android together). OAGOOGLE0100168421 ("Andy informed me that he has been asked by his GC to hold off any meetings until the patent issue is resolved."

[210] *See, e.g.*, GOOGLE-01-00063286, TX 10 (GOOGLE-12-10000022).

[211] Expert Report of Robert Zeidman, Jan. 8, 2016.

[212] Expert Report of Robert Zeidman, Jan. 8, 2016.

[213] *See, e.g.*, GOOGLE-12-00003871, at 873; GOOGLE-01-00017154 ("Why Java?" carriers require it."); GOOGLE-01-00019511 ("The nature of the cellular market is that we are *require* to have java due to carrier requirements, etc."); TX 7 (GOOGLE-01-00019527 ("carriers require managed code")); GOOGLE-04-00055169 ("We can't get out of the gates without [Carriers] and [OEMs]"); GOOGLE-26-00025071 ("The carriers are the customers of cell phones – not the end users.").

[214] *See, e.g.*, TX 7 (GOOGLE-01-00019527, at 527).

[215] *See, e.g.*, TX 24 (GOOGLE-01-00025375 at 419 ("Strategy: Leverage Java for its existing base of developers."); TX 21 (GOOGLE-02-00111218, at 218 ("If we play our cards right, we can also leverage not only existing developers, but applications as well.")); GOOGLE-02-00081462.

[216] *See, e.g.*, GOOGLE-01-00075935 at 935 ("We will ship a more stable product sooner if we do as much as possible in Java").

162. These attributes satisfied Google's need to quickly attract a user base to Android in order to monetize its new applications platform.[217] In 2006, a time when Microsoft was still viewed as the likely mobile competitor, in an e-mail to his Android team, Andy Rubin articulated both the time pressure his team was under and the benefits of the Java platform to solve the need to attract developers: "We need to provide an alternative to MSFT, and we need to do it in such a way as we don't fragment 3rd party developers….Java has very little fragmentation, and it's adoptable. If we play our cards right, we can also leverage not only existing developers, but applications as well."[218]

163. Without a competitive app marketplace—enabled by the millions of Java developers—Android devices would struggle to compete with Apple's iPhone.[219] Google also described concerns that delays in reaching market would result in former BlackBerry users migrating to iPhone instead of to Android, robbing Google of significant first-mover effects inherent in platform markets.[220] The time-to-market advantage, in particular, was paramount to Google, as cited by Andy Rubin:

> "[Y]ou have a window of opportunity in smartphones . . . . You have to ship as soon as feasibly possible. I mean, you go to extraordinary lengths to ship sooner, because it's a very dynamic market. And it could shift directions at any time . . . . *So my job . . . was to just do everything that I possibly could to get my solution to the market in the shortest time possible*."[221]

The time-to-market was also significant to the Android founding team financially. In its agreement to purchase Android, Inc., Google agreed to certain milestone payments contingent upon, among other things, securing a relationship with a major wireless carrier within 3 years.[222]

164. Google's willingness to knowingly copy Oracle's Java API packages and commercialized\ the Java-based Android platform without reference to the intellectual property rights of Oracle is another indication of the seriousness with which it took the pressure to get to market with a competitive mobile ecosystem. It is also further evidence of the import of the Java platform to those aspirations.

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[217] *See e.g.*, GOOGLE-22-00060007, at 0039.

[218] TX 21. (GOOGLE-02-00111218).

[219] *See* GOOGLE-00302808, at 808 ("[W]e need to provide at least 70% to the developer to make [Android] Market competitive with other app stores (*e.g.*, iPhone App Store).").

[220] *See* GOOGLE-00383073, at 075.

[221] Deposition of Andrew Rubin, July 27, 2011, at pg. 180:1-12.

[222] GOOGLE-00303922, at -3929, -3931, -4000.

165. Google was well aware of its obligation to obtain a license and of the litigation risk in its conduct. The head of Android and Android's original engineers knew they needed a license and were familiar with Sun's Java licensing scheme. Andy Rubin, while at Danger and Android Inc., negotiated with Sun for a Java commercial license.[223] And Danger, indeed, took a Java license for Java ME from Sun.[224] Android's lead virtual machine engineer Daniel Bornstein and senior staff engineer Brian Swetland worked with Rubin both at Danger and Android Inc.. Another engineer, Hiroshi Lockheimer, worked with Rubin at Danger.[225]

166. Soon after acquiring Android, Google concluded that it "must take [a] license from Sun" and that an ex-Sun employee, Tim Lindholm, would "support [the Android team in] negotiat[ing] the first OSS J2ME JVM license with Sun."[226] Mr. Lindholm's role during these negotiations took "mostly [] the form of helping negotiate with [his] old team at Sun for a critical license."[227] Tim Lindholm was a distinguished Java engineer at Sun for over a decade before joining Google.[228] Google also noted in an internal presentation that if it could not agree to a co-development partnership with Sun, it would have to take a license from Sun for Android's use of Java." In the month before Google completed its acquisition of Android, another Google presentation concluded that Google "[m]ust take [a] license from Sun." That same month Andy Rubin sent an email to Tim Lindholm of Google that attached a document regarding Google's discussions about licensing Java from Sun that stated "Google needs a TCK license."

167. After Google completed its acquisition of Android, Andy Rubin articulated two options if the negotiations with Sun failed: "If Sun doesn't want to work with us, we have two options: 1) Abandon our work and adopt MSFT CLR VM and C# language – or 2) Do Java anyway and defend our decision, perhaps making enemies along the way."[229]

168. In a 2006 email to Google engineering manager Greg Stein, Rubin wrote, "Java.lang apis are copyrighted. And sun gets to say who they license the tck to . . . ."[230] Google continued to recognize that

[223] Deposition of Vineet Gupta, July 26, 2011, at pg. 102:4-23 (Danger negotiation); Deposition of Leo Cizek, July 22, 2011, at pg. 76:3-11 (Android Inc. negotiation).

[224] Deposition of Andy Rubin, July 27, 2011, at pg. 77:7-8 ("at Danger, we entered into a licensing agreement with Sun"); Trial Transcript of Brian Swetland, April 20, 2012, at pg. 950:9-14; OAGOOGLE0100036648.

[225] Trial Transcript of Brian Swetland, April 20, 2012, at pg. 953-954.

[226] TX 1 (GOOGLE-00-00001772).

[227] TX 17.

[228] Deposition of Tim Lindholm, September 7, 2011, at pg. 6:22-8:11.

[229] TX 7 (GOOGLE-01-00019527-528 at 528).

[230] TX 18 (GOOGLE-01-00018470)

it needed a license and that the Java APIs were copyrighted.[231] And Sun continued to ask Google to obtain a Java license.[232]

169. After bringing Android to the market, Google acknowledged the looming lawsuit it would surely face because of its unauthorized copying of Java in Android.[233] In August 2010, Mr. Lindholm wrote to Andy Rubin that Google's founders Larry Page and Sergey Brin had asked him "to investigate what technical alternatives exist to Java. . . ." [234] Lindholm added that his team had "been over a bunch of [alternatives to Java]" and that "they all suck." [235] His conclusion was "that [Google] need[ed] to negotiate a license for Java . . . ."[236]

D. Android copying of API packages

170. I understand that a jury found that Google infringed Oracle's copyrights in Java SE 1.4 and Java SE 5 in all commercially released versions of Android (up through Froyo) by copying the structure, sequence and organization of the 37 Java API packages as reflected in the actual code that Google acknowledged it had reproduced. As I understand from the report of Robert Zeidman, Google continued to copy the actual code and the structure, sequence and organization for the 37 Java API packages in Android Versions 2.3 (Gingerbread, API level 9) and continued to 5.1 (Lollipop, API level 22) and through Marshmallow.

E. Incompatibility of Android and Java

171. Although Android copies a set of Java API packages, I understand that Android is not actually compatible with Java.[237] This incompatibility is particularly meaningful, as it constitutes a violation of

[231] TX 326 (GOOGLE-12-00027267) ("Google buys the rights to Java from Sun (patents, copyrights, etc)"); TX 230 (GOOGLE-02-00020474) ("Sun has a different license for its library for SE and ME.").

[232] TX 1002 (GOOGLE-01-00031204) ("Sun asked us to certify Android through the Java process and become licensees of Java")

[233] TX 326 at GOOGLE-12-00027268 (dated February 19, 2009) (proposing "Google buys the rights to Java from Sun (patents, copyrights, etc)" and describing as "Good for Google" because "Our Java lawsuits go away"); Additional correspondence indicates that a Google engineer (formerly at Sun) remarked to Google executives that "we need to negotiate a license for Java under the terms we need." TX 10 (dated August 6, 2010).

[234] TX 10 (GOOGLE-12-10000022).

[235] TX 10.

[236] TX 10.

[237] Schmidt Report, ¶¶. See also, Deposition of Daniel Morrill, Jul. 12, 2011, at pg. 87 ("A. Because we were frequently reminded that Android is not Java compatible and that it would be technically inaccurate to describe it as Java compatible, this was repeated frequently and took on, you know, the sense of a broken record."); Deposition of Owen Astrachan, Nov. 9, 2011, p. 280:5-25 ("There are Java programs that… would not run on Android" and later "Any Android programs that use non-Java APIs are not going to run on a Java Virtual Machine").

Java's promise to developers of "write once, run anywhere." To ensure compatibility, Java provides and requires that licensees pass its standard compatibility test (the TCK as I discussed earlier). Professor Doug Schmidt had Android tested for compatibility against the Java TCK; Java-based Android failed the tests.[238]

F. Conclusion

172. By the mid-2000s, Java had developed over approximately 15 years to become one of the most widely-used software application platforms in the world. The Java platform was pre-eminent in its role as the software platform for seamless interaction between devices and applications. It had played this role in PCs, in laptops, in servers, in PDAs, in phones, and many other kinds of devices. As the mobile phone revolution took off, Java was poised to take off with it. But Google chose not to license Java. Google also chose not to create its own platform from scratch, because Google understood that it needed a means of rapid entry and adoption by developers and partners (such as OEMs and carriers) to compete. And Google determined that such rapid entry and adoption could not be achieved without Java.

173. Google's Java-based Android, and the large Java developer base that Sun had built, became very successful. Android, together with the iPhone, came to dominate the exploding mobile device market. As a result, Android crowded Oracle's Java platform out of the most important device category of the last decade, with substantial, adverse consequences to Oracle that will continue indefinitely because of the dynamic nature of platform competition. In the remaining sections of my report, I investigate these effects through the specific lens of the fair use factors.

VI. THE IMPORTANCE OF INTELLECTUAL PROPERTY AND COPYRIGHT PROTECTION

A. The economics of intellectual property

174. Copyrighted creative works are examples of "intellectual property" or "IP," which in the United States also includes patents, trademarks, and trade secrets. The economic function of intellectual property is to give people and companies that create something new a mechanism to preserve the value of such creations, and thereby create and maintain incentives for such creation.[239] The idea that IP is valuable to promote creative activities is fundamental to United States civil society and even appears in the U.S.

[238] Expert Report of Douglas Schmidt, January 8, 2016.

[239] *See, e.g.*, Arrow, Kenneth. "Economic welfare and the allocation of resources for invention." The rate and direction of inventive activity: Economic and social factors. Princeton University Press, 1962. 609-626. Or, Posner, Richard A., and William M. Landes. "The economic structure of intellectual property law." (2003), Besen, Stanley M., and Leo J. Raskind. "An introduction to the law and economics of intellectual property." The Journal of Economic Perspectives 5.1 (1991): 3-27.

Constitution: "The Congress shall have Power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[240]

175. Economically, the key feature of intellectual property is that the essence and hence the value of a creation can be separated (at least to some degree) from any physical object that might represent, use or embody that creative essence.[241] For example, if I build a better mousetrap, once I sell one to someone else, that buyer can, in principle, understand its design and that design can be separated from the specific mousetrap I sold. It can be represented in a blueprint or other formal specification, or it might be possible for someone simply to carry it around in his head. Similarly, if I write a song, it might be embodied in sheet music or a CD, but once someone has heard it he might also carry it around in his head.

176. Preventing the "theft" of intellectual property requires different measures than preventing the theft of physical property. If I buy or build myself a car, I can prevent your stealing it by locking it up, and whether I lock it up or not it is a crime for you to take it from me. But if I come up with a new *design* for a car or a car component that no one has ever thought of before, I cannot protect that creation in the same way. I might be able to keep it a secret, but it many cases, to realize the full value of the creation, I want to be able to sell objects that embody the creation to other people, and possibly many other people. If the creator sells the newly designed car to someone else, and that buyer copies the new design and sells the copy to a third party, the creative essence has been stolen, but no physical theft has occurred. Similarly, if I write a novel and sell you a bunch of paper on which the novel is reprinted, you could copy those pages and sell the copy to someone else without having taken any physical object away from me. Copyrights, patents and other forms of legal protection for IP are society's way to prevent the theft of creative essence, by giving creators the right not just to possess their creations, but also to control the way in which those creations can be used by others.

177. The legal recognition of intellectual property through mechanisms such as copyright preserves the incentive for people to engage in creative activities, by giving them a measure of control over how their creations will be used. Absent such protection, valuable creations will likely be under-provided by the

[240] U.S. Const., Art. I, § 8.

[241] Economists characterize most intellectual property as *nonrival* in that it can be used by multiple consumers at no additional marginal cost.

market.[242] The type of control in question takes the form of specific legal rights, and different forms of intellectual property provide somewhat different types and mechanisms of control.

178. In an economy that recognizes private property, these rights are the basis for a wide variety of economic transactions, and IP enforcement is motivated by a desire to achieve efficient outcomes.[243] If I own a piece of land, I can choose to live on it myself (with or without constructing a building); I can rent it to someone else; I can sell it; or I can do absolutely nothing with it.[244] While there are always some legal restrictions on my possible uses (e.g., I need a permit to use it for a toxic waste dump; I might be forced to sell it to the government if they are building a highway across it), subject to those restrictions the general presumption is that it is up to me to choose how to use it.

179. This same presumption also applies to IP; in other words, subject to specific restrictions, the IP owner may choose how to use it so as to encourage innovation and creation. In particular, the owner can sell it to someone else or rent it out. But the fact that IP is not inherently tied to any physical object makes these choices potentially more diverse and complicated than the choices available to the owner of physical property. While renting a given plot of land to multiple users is a somewhat complex undertaking, creative works are routinely "rented" to many different people at the same time. For this reason, we typically say that the owner is "licensing" the IP to users rather than "renting" it. Further, the separation of the IP from physical products makes it possible to "subdivide" the rights in complex ways. If someone wants to use a song in a commercial advertisement, he needs to get a license from the holder of the copyright on that song. But this could happen in many different ways. As with any "rental" contract, he could seek a license for a short time or an extended period. But there are other options as well: the license might cover only a particular ad, or a whole line of ads, or it might also cover other uses such as playing it at a convention. Typically, the license to use it in an ad would not cover the right to use it in making a movie. If the owner and a potential licensee agreed it could be licensed for any and all uses. Further, if a car maker is licensing a song to use in its car ad, it might want to ensure that the same song will not be licensed for any other car maker's commercials. If the two parties agree, that condition could be included in the license contract.

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[242] *See, e.g.*, Nordhaus, William D., *Invention, Growth, and Welfare: A Theoretical Treatment of Technological Change*, MIT Press, 1969.

[243] Coase, Ronald H., "The Problem of Social Cost," *Journal of Law and Economics* 3.1, 1960.

[244] Lately people have gotten more creative than ever with physical objects, as technology platforms have enable the "sharing economy."

180. The fact that the same IP can be licensed to many different parties in different ways creates the possibility that the terms of licensing will differ by the context of use and the nature of the licensee. A copyright owner might judge that having her song sung by a particular artist or in a particular venue will increase the willingness of others to pay to use it, so she may be willing to license it for free under those conditions. More generally, a license is a potentially complex contractual agreement between the parties, with a variety of terms and conditions that cover payments between the parties, each party's rights, and restrictions on each party's actions. All else equal, the owner of the IP will give the licensee more flexible and broader use of the IP in return for more compensation, but will accept lower compensation (sometimes even zero) under restricted circumstances.

181. The separation of IP from physical objects also means that the legality of any use of IP is determined by the terms of the applicable license agreement, not by the physical pathway by which the user got access to the creative work (unless the license specifically addresses that issue). For example, I have for many years undertaken analysis of music licensing and music license royalties. In that work, I have become familiar with the general licenses required for the performance and copying of music. Bars or restaurants need the permission of the copyright holder in order to have a copyrighted song performed or played for customers. The American Society of Composers, Authors and Publishers (ASCAP) (and other similar organizations) licenses establishments to do this on behalf of copyright owners.[245] A bar with an ASCAP license can play any ASCAP song, and ASCAP doesn't care if they play a CD, they turn on the radio, or they hire Suzie Singer to perform it live. Conversely, in the absence of such a license, ASCAP will claim that the bar is violating the composer's copyright by playing for its customers an ASCAP song from a CD (even though the maker of the CD got appropriate permission to record the song and sell the CD) or playing the radio for its customers (even though the radio station has an ASCAP license to broadcast the song over the airwaves). In this way, the right of public performance in a particular venue is a distinct right that can be separated from the rights to copy it or perform it in other contexts (such as singing it in the shower).

182. The potential complexity of licensing arrangements and the separation of the right to use IP from the acquisition of the protected creative material are important in the context of this case.[246] The Java API packages at issue are libraries of copyrighted computer code written by Sun engineers. The code is widely

[245] About ASCAP, ASCAP, http://www.ascap.com/about.

[246] Also important to the existence of the separate right to license IP in an "open" way. These "open source" licenses remain enforceable on their own terms. Without copyright, there is no way to force compliance with such restrictions. Ultimately, then, "open source" licenses are another way that IP gives copyright holders the right to choose the means of dissemination. See Expert Report of Gwyn Murray, February 8, 2016.

available, published in various forms. But Oracle realizes the value of the creation of Java by licensing it for different uses under specific terms that differ by the nature of the use. As discussed further below, there are some uses for which one can obtain a Java license for free, but this free use applies only to certain circumstances or comes with important restrictions. For uses that do not meet the conditions of the free licenses, Oracle licenses Java and collects revenue in return. Google used these copyrighted libraries in building Android, but never obtained a license from Oracle to do so and never paid for the use of the creative product.

B. The economics of copyright

183. The Copyright Act provides that: "Copyright protection subsists … in original works of authorship … includ[ing] … literary works." 17 U.S.C. § 102(a). "Literary works" are works "expressed in words, numbers, or other verbal or numerical symbols." *Id*. § 101. "Computer programs," also defined in § 101, are "literary works" and copyright protected.

184. Copyright protection is founded on the principle that our society benefits greatly and continuously from the creation and dissemination of new expressive works. The social benefits of creative expression would be reduced if creators were subject to competition from other parties copying their works without restriction.[247] Copyright thus incentivizes the creation of new works by ensuring that creators can enjoy a return on their investment without interference from infringers.[248] Otherwise, it would be much more profitable to merely copy and sell the works of others (i.e., to free ride on their investments) than to create and sell one's own works.[249]

[247] See Robert Cooter & Thomas Ulen, Law and Economics 128 (2000); Wendy J. Gordon & Robert G. Bone, Copyright, in II Encyclopedia of Law and Economics192-3 (Boudewijn Bouckaert & Gerrit De Geest eds., 2000); William M. Landes & Richard A. Posner, An Economic Analysis of Copyright Law, 18 J. Legal Stud. 326 (1989); Alfred C. Yen, The Legacy of Feist: Consequences of the Weak Connection Between Copyright and the Economics of Public Goods, 52 Ohio ST. L.J. 1343, 1365-69 (1991). See also William W. Fisher III, Reconstructing the Fair Use Doctrine, 101 Harvard Law Review, 1700 (1988).

[248] *See, e.g., Sony Corp. v. Universal City Studios, Inc.*, 464 U.S. 417, 450 (1984) ("Even copying for noncommercial purposes may impair the copyright holder's ability to obtain the rewards that Congress intended him to have."). This observation is not inconsistent with any of the following: (i) some creators have other motivations in addition to profiting economically from their creations, (ii) some creators may not care about profiting at all, and (iii) even without copyright (or other IP) protections, some creation would still occur. See also Michael G. Anderson and Paul F. Brown. The Economics Behind Copyright Fair Use: A Principled and Predictable Body of Law, Loyola University Chicago Law Journal 24:2, 144-177 (1993).

[249] Michael S. Green, Copyrighting Facts, Indiana Law Journal 78, 925-26 (2003).

185. Because society benefits not only by the creation of new works, but also by their marketing and distribution, copyright law also gives to creators the power to decide when and how to circulate works.[250] This does not require the creator to transfer the work to end users directly; part of the purpose of copyright is to facilitate licensing of creative works for use or distribution by others. We should expect that in most cases, creators will use copyright protection such that audiences gain access, either directly from the creator or through an indirect mechanism such as licensing. By enabling the orderly licensing of copyrights and by protecting distribution rights, copyright makes possible the business of connecting works with audiences.

186. Recognizing that the "ultimate goal of copyright is to expand public knowledge and understanding . . . by giving potential creators . . . a financial incentive to create informative, intellectually enriching works for public consumption,"[251] courts apply the Copyright Act to serve these ends. Properly applied, copyright law serves society as a whole: "[W]hile authors are undoubtedly important intended beneficiaries of copyright, the ultimate, primary intended beneficiary is the public, whose access to knowledge copyright seeks to advance by providing rewards for authorship."[252]

187. Economic theory has long recognized that copyright laws enhance overall social welfare and efficiency.[253] Economists view copyright policy as an attempt to achieve a socially optimal balance of production and consumption of copyrighted material.[254] Economists generally hypothesize that, in a properly functioning market for copyright protection, the overall supply of creative works should be increasing, benefitting society as a whole.[255] Thus, protecting copyright protects not only creators, but also creativity itself.

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[250] *See id*. at 423-33 ("[T]he Copyright Act grants the copyright holder 'exclusive' rights to use and to authorize the use of his work in five qualified ways, including reproduction of the copyrighted work in copies."). Also William M. Landes & Richard A. Posner (2003) The Economic Structure of Intellectual Property Law, Belknap Press.

[251] *Authors Guild, Inc. v. Google, Inc.*, Case No. 13-4829-cv, *12 (2d Cir. Oct. 16, 2015).

[252] *Id*. at *13.

[253] *See, e.g.*, William M. Landes and Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. Leg. Stud. 325, 235-33, 344-53 (1989) ("A distinguishing characteristic of intellectual property is its 'public good' aspect . . . . For copyright law to promote economic efficiency, its principal legal doctrines must, at least approximately, maximize the benefits from creating additional works minus both the losses from limiting access and the costs of administering copyright protection.").

[254] Richard Watt, *An Empirical Analysis of the Economics of Copyright: How Valid are the Results of Studies in Developed Countries for Developing Countries?*, The Economics of Intellectual Property 65 (World Intellectual Property Organization, 2009), http://www.wipo.int/export/sites/www/ip-development/en/economics/pdf/wo_1012_e_ch_3.pdf.

[255] As copyright protection increases, the creator's rewards from producing original material also increase, leading to a greater willingness to supply such material to the market. *See id*. at 65 note 3.

188. In certain circumstances, deemed fair use, copying protected material is permissible, to the extent that it further fosters creative expression.[256] Fair use does not devalue the underlying purpose of copyright protection. To the contrary, properly understood it supports and reinforces the goal of creating social benefit from new creative expression. Of course, fair use must be properly balanced against the primary goals of copyright as to not enable freeriding and thus destroy the carefully calibrated system of incentives in the copyright IP regime. To that end, in order for the unauthorized use of protected material to qualify as fair use, I understand that courts generally evaluate four statutory factors: (I) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes, (II) the nature of the copyrighted work, (III) the amount and substantiality of the portion used in relation to the copyrighted work as a whole, and (IV) the effect of the use upon the potential market for or value of the copyrighted work. (17 U.S.C. §107). The second and third of these factors in this case involve largely technical issues, and are discussed in the reports of Professors Kemerer and Schmidt. The first and fourth factors involve important economic considerations, and are discussed in this report.

VII. FAIR USE ANALYSIS

189. I understand that the focus of this matter is on whether or not Google's copying of the Java API packages constitutes what is known as a "fair use." Fair use is described in the U.S. Copyright Statute as follows:

> § 107 . Limitations on exclusive rights: Fair use
>
> Notwithstanding the provisions of sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—
>
> [Factor 1] (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
>
> [Factor 2] (2) the nature of the copyrighted work;
>
> [Factor 3] (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and

[256] Gordon, Wendy, Fair Use as Market Failure: A Structural and Economic Analysis of the Betamax Case and Its Predecessors, 82 Columbia Law Review 1600 (1982); William W. Fisher III, Reconstructing the Fair Use Doctrine, 101 Harvard Law Review, 1744-1788 (1988).

> [Factor 4] (4) the effect of the use upon the potential market for or value of the copyrighted work.
>
> The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors.[257]

I understand the Federal Circuit in this case has provided further guidance and detail on these fair use factors.[258] I have read and considered this in my analysis below.

190. In the remainder of this report, I will present an analysis of those aspects of these statutory factors that bear on economic issues and considerations and thereby demand economic analysis. In particular, under Factor 1, I will address the commercial nature of Google's use of Java, and show that it was not transformative. Under Factor 4, I will describe the economically appropriate way to analyze the "potential market for or the value of the copyrighted work," and describe in some detail the harm to that market engendered by Google's unauthorized copying of Java. Finally, I will respond to those portions of Google's experts' reports where they opine about economic matters.

191. As noted above in the summary of conclusions, I find that those aspects of the statutory fair use factors that are economic in nature all point strongly toward a finding that Google's use of the Java API packages in Android is not a fair use. Under Factor 1, I find that Google's use of the Java platform is highly commercial, and not transformative because it supersedes the Java platform in the market. Under Factor 4, I find significant evidence of market harm in the form of specific lost opportunities, and broader economic substitution. In the following sections I will describe how I arrived at these conclusions.

VIII. FACTOR 1

> **(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;**

192. Consideration of Factor 1 requires economic analysis, because understanding the "purpose" of any action by a firm requires understanding of firm profit motives and incentives. And in assessing the degree of commerciality of a given good or service, as an economist, I consider the intent of the firm in choosing to use the copyrighted work, the magnitude of profits accruing to the firm from its use, and the ongoing competitive advantages provided by the use. All of these considerations take into account the company's business model and the competitive landscape of the markets in which it operates.

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[257] 17 U.S.C. § 107

[258] *Oracle America, Inc. v. Google Inc.*, 750 F.3d 1339 (Fed. Cir. 2014).

193. This analysis is based on the economic concepts I have discussed throughout this report. Companies that compete in platform markets (like Google) are subject to different competitive pressures, and must consider economic forces such as network effects and scale that may not be present in other industries. Thus the analysis of commerciality must also consider how the use of the copied work protects or extends the user's business (and profits) from current and future competition. Furthermore, as discussed above, it is inherent in a platform market that users are economically interdependent, and the platform owner will frequently choose to subsidize some uses and users in pursuit of maximizing the overall value of the network. This means that superficial revenue flows can be misleading as to true sources of profit in the platform. No economist would suggest that because over-the-air television programming is given free to viewers, this means that TV stations are non-commercial or that these programs do not earn profit. Similarly, Android is not "free," but rather conforms to a multi-sided market business model in which certain users of the platform (advertisers, some developers) subsidize the activity of other users (users, OEMs, some developers, and carriers).

194. I also draw upon the economic notion of market substitution. I will explain the underlying economics that show why the substitution of Java-based Android in the many use markets for Oracle's Java platform (e.g., mobile, wearables, tablets, and many others described more fully herein) means that Google's use is not transformative.

195. Using the economic framework described above, in this section I analyze the purpose and character of Google's use of the Java API packages and find that this factor weighs against fair use. Specifically, I find Google's copying is both highly commercial and non-transformative. I also review the Factor 1 opinions offered by Google and find them unpersuasive.

A. Commercial nature of Android and its use of Java

196. Google's use of the Java API packages in Android is unmistakably commercial. First, Google's copying of the APIs was a strategic business decision driven by a profit motive. The use of the Java API packages was intended to allow Google to launch Android within a critical time window, providing a built-in base of developers and OEM/carrier ecosystem to jumpstart the growth of the Android ecosystem to more effectively compete with Apple's iOS, pre-empt other mobile phone platform competitors, and bolster Google's ability to defend its core search business in an increasingly mobile-centric market. Without this jumpstart, the Android platform would have taken much longer to develop a network of developers. It is quite possible that with such a time delay Android would never have reached platform critical mass.

197. As a result of its copying of the Java API packages and timely market entry, Google has enjoyed enormous monetary benefits from Android. Google has generated over [redacted] in Android revenue, with Google's top executives' explaining that "Android is hugely profitable."[259] On Google's Q3 2010 earnings call, then-CEO Eric Schmidt described the importance and profitability of Android to Google.

> So in the open-source approach that means we give the software away, which is always paradoxical and people say, "How do you make money from that?" Let's start with the fact that the evidence we have that the people who use Android search twice as much as everything else. So clearly, there's more revenue associated with those searches. Another thing of course is if they're using Android systems, the revenue that we share in the search is shared with the operator but not with anybody else. So again it's more lucrative. So not only is there more searches and there's more ads but it's also more lucrative. So on that basis alone, Android is hugely profitable.[260]

198. Finally, the use of the Java API packages in Android continues to be critical to the long-term profitability and health of Google. From a competitive perspective, Android with its large developer community is an essential counterbalance to potential competitors, and is crucial in defending Google's core search audience.[261] In addition, the flexibility provided by the Java API packages means Android is well-suited to be the centerpiece of Google's expansion into a number of new markets.

1) The role of the Java API packages in Android's commercial success

199. Given Android's 83% market share today, it may be hard to imagine a time when the future of Google's mobile presence was in doubt. [262] However, a review of the contemporaneous competitive market context reveals that Google's use of Java in Android was motivated (in its own words) by a need to get to market immediately to avoid being "locked out."[263] The intense time pressure to launch Android stemmed from a need to compete with Apple's iOS mobile ecosystem and a confluence of broader user trends toward mobile use that threatened Google's core PC search advertising business. Specifically, users were shifting from PC to mobile environments, and spending more time using mobile apps than PC

[259] Google Inc., "Q3 2010 Earnings Call Transcript," October 14, 2010, p.10.

[260] Google Inc., "Q3 2010 Earnings Call Transcript," October 14, 2010, p.10; Eric Schmidt's 4/24/2012 trial testimony (at Trial Tr. 1458:12-16) was: "The vast majority of Google's revenue at the time and today comes from search revenue. And so the primary reason to have something like Android is that people will do more searches, and then we'll get more money as a result. And that's how we, essentially, pay for the strategy of Android." Eric Schmidt also agreed that "the revenue that [Google] received as a result of the additional search revenue generated by Android paid for Android." Trial Tr. 1456:15-19.

[261] GOOGLE-01-00090213.

[262] Exhibit 3.

[263] GOOGLE-00298438, at 449.

web browsers. This combination of threats—iOS, shift to mobile, and rise of mobile —made the timing of launch and developer adoption of Google's Android platform particularly critical. Furthermore, as explained above, early entry in a platform market, such as mobile phones, is extremely important. Google saw the Java API packages as a way to launch within a short time period, quickly attract the developers who were critical to Android's success, and speedily achieve acceptance and adoption by the wireless industry (which include OEMs and carriers) who had already widely accepted and adopted Java.[264] In this way, there is a direct relationship between Google's strategic business imperatives and the copying of the Java API packages.

a) Time pressure

200. As described above, Google's core revenue generating product, search advertising, was threatened by the ever more prevalent use of mobile devices in the early 2000s. The acuteness of this threat was heightened with the introduction of Apple's wildly successful iPhone in 2007. Below I describe the economic reasons that time-to-market was essential for competing with Apple and in the mobile ecosystem more broadly, and describe the contemporaneous statements from Google that demonstrate the urgency Google felt to launch Android.

(i) Economics of early entry and scale

201. Timing of entry is critical in platform markets because (1) such markets typically end up with only a few competitors, and (2) network effects frequently mean that an early lead can never be overcome. The number of competing platforms that a market can ultimately sustain is related to the strength of network effects, the heterogeneity of user preferences, and the cost and difficulty of "multihoming" or moving between multiple platforms.

202. The mobile platform market can sustain relatively few profitable platforms. Stronger network effects make smaller networks uncompetitive, reducing the number of platforms. On the other hand, a user base with a range of different preferences will help sustain multiple platforms.[265] In the case of mobile, strong network effects come in the forms of users' preference for more and better apps as well as developers' need for more users and a bigger market.[266] There are some heterogeneous preferences in the

[264] TX 158 at GOOGLE-01-00025584 ("Fact…6M Java developers worldwide. Tools and documentation exist to support app development without the need to create a large developer services organization. There exist many legacy Java applications. The wireless industry has adopted Java, and the carriers require its support.")

[265] Farrell, Joseph, and Paul Klemperer. "Coordination and lock-in: Competition with switching costs and network effects." Handbook of industrial organization 3 (2007): 1967-2072.

[266] Bresnahan, Timothy F., Jason P. Davis, and Pai-Ling Yin. "Economic value creation in mobile applications." The Changing Frontier: Rethinking Science and Innovation Policy. University of Chicago Press, 2014.

mobile platform market, however. For example, some users prefer Apple-branded devices and other users are more insensitive to brand, but sensitive to price. The result of these two conflicting factors is that it will not be winner-take-all, but there will only be a few platforms that can achieve the necessary scale. In this type of environment it becomes very important to enter the market early and become a dominant player.

203. The corollary of this imperative, of course, is that those firms that do enter early and achieve the necessary scale are in an unusually attractive competitive position in a platform market. Mobile platforms have followed this very pattern with very few platforms (primarily Apple and Google) reaching scale early by capturing significant consumer and developer adoption. For those firms, the consistency of their performance since gaining scale shows the strength of the network effects at work.

204. It is important to emphasize that these network effects can be very large, as they are in the case of mobile platforms. Windows (and DOS before it) during the early days of the PC industry demonstrated that the availability of applications was crucial to the adoption of the operating system by consumers. The availability of applications was in turn driven by having a critical mass of consumers using the operating system. This classic "chicken and the egg problem" is crucial to adoption of systems with network effects and provided a huge barrier to entry for any newly developed platform.[267] Similarly, the direct and indirect network effects characterizing mobile platforms today are significant for any newly developed platform, and are important to growing and protecting mobile platform market share. It is difficult to overemphasize the importance of network effects in these cases. A mobile platform without applications, or without consumers has essentially zero value.

[267] The "application barrier to entry" was also among the subjects of *US v. Microsoft*, an antitrust proceeding involving Microsoft's Windows operating system. The Court in that matter held that an operating system wanting to compete would need "a large and varied enough base of compatible applications," and "a potential rival would need to induce a very large number of ISVs [Independent Software Vendors] to write to its operating system." In that Microsoft case, the Court identified operating systems that were unable to compete with Windows because of this applications barrier, including include BeOS, OS/2 Warp, Linux, and Mac OS. (Findings of fact from *US v. Microsoft*, paragraphs 45-51, available at http://www.justice.gov/sites/default/files/atr/legacy/2006/04/11/iii-b.pdf). Interestingly, at the time, Microsoft had approximately 5 million Microsoft developers (Craig Mundie, The Commercial Software Model, May 3, 2001. Available at http://web.archive.org/web/20010505054014/http://www.microsoft.com/presspass/exec/craig/05-03sharedsource.asp.), fewer than the 6 million Java developers at the time of Google's copying of the Java API packages.

(ii) Google's expressed need to develop a mobile presence

205. As I describe above, Google was under intense time pressure to expand its mobile presence. Google's public acknowledgement of the risk of the emerging mobile usage patterns dates back to as early as 2004.[268]

> If we are unable to attract and retain a substantial number of [mobile] device users to our web search services or if we are slow to develop products and technologies that are more compatible with non-PC communications devices, we will fail to capture a significant share of an increasingly important portion of the market for online services.[269]

As Google's 10-K reported at the end of 2005, "[t]he number of people who access the Internet through devices other than personal computers, including mobile telephones . . . , has increased dramatically in the past few years."[270] The 10-K went on: "[I]f we are slow to develop products and technologies that are more compatible with non-PC communications devices, we will fail to capture a significant share of an increasingly important portion of the market for online services." [271]

206. As described above, in mid-2005, Google acquired mobile platform provider Android, Inc. Andy Rubin, Senior Vice President who remained in charge of Android at Google explained the pressure he and his team were under to ship the product as quickly as possible.

> "[Y]ou have a window of opportunity in smartphones . . . . You have to ship as soon as feasibly possible. I mean, you go to extraordinary lengths to ship sooner, because it's a very dynamic market. And it could shift directions at any time . . . . So my job . . . was to just do everything that I possibly could to get my solution to the market in the shortest time possible."[272]

[268] Google SEC Form 10-K (2004), at 58.

[269] Google SEC Form 10-K (2004), at 58.

[270] TX 3215 at 65.

[271] TX 3215 at 65.

[272] Deposition of Andrew Rubin, April 05, 2011, 180:1-12.

207. Senior VP of Engineering and eighth Google employee Urs Hoelzle described in his deposition the "desperation" that characterized Andy Rubin as Rubin was developing the Android platform in 2006:

> Q … So your perception at the time you wrote your email on July 23rd, 2006, was that Mr. Rubin was desperate; true? A He was rushing, and I used the words "desperate" to say, gee, you're not in a – you know, you're not planning to delay things a lot for a deep inspection, like -- which I recommended. Q You used the word "desperate. A. I totally used the word "desperate," yes.[273]

208. The payouts connected to the Android acquisition were contingent upon getting to market and shipping certain volumes of Android phones within a limited time period. Critically, all Milestones depended on first reaching Milestone 1, otherwise all future earn-out payments would be forfeited, as shown below in Figure 36.

Figure 36: Android Milestone Payment Timeline[274]

> 1.5 Limitations on Milestone Payments.
>
> (a) If Milestone 1 is not achieved pursuant to this Article I by the third anniversary of the Closing extended for any intervening Milestone Extension Period, all Milestone Payments shall be unearned, forfeited and retained permanently by Buyer.

Milestone 1 required developing a working phone and securing a relationship with a major carrier, as shown below in Figure 37.

[273] Deposition of Urs Hoelzle, November 24, 2015, p. 254-255.

[274] GOOGLE-00303922, at -3931.

Milestone 1

Buyer's mobile telephone handset manufacturing partner(s) shall have shipped a minimum of one functional mobile telephone using an operating system developed by the Company (a "**Company Enabled Phone**"), and Buyer shall have entered into a definitive agreement with at least one wireless carrier (which carrier must provide service to a minimum of 15 million customers) providing for the service contract related to the Company Enabled Phone. The Company Enabled Phone may not be a mere prototype but rather shall be a functional mobile telephone that, if replicated, would be suitable for use by a large number of consumer end users.

209. The remaining milestones dictated an aggressive ramp schedule, requiring shipments of 5 million, 10 million, and 50 million phones to reach the full payout of the Milestone payments ($60,000,000).[276] The structure of the Android purchase agreement illustrates both the importance that Google placed on launching a mobile platform, and the economic pressure Rubin and team were under to get Android to market quickly.

210. Google continued to build Android throughout 2005 and 2006, and also began outreach to OEMs and carriers to cultivate the necessary partnerships for its mobile platform. The Android team sought to fulfill Google's interest in speedy time to market and to meet its own objectives under Milestone 1 of its acquisition agreement. In late 2008 Google launched the first Android phone and thus began its methodical effort to repeat its PC search playbook – building scale, extending control, and profiting in this new arena. The timing of market entry was of paramount importance, which Google remained attuned to even as of 2008. A 2008 presentation on Android, pictured below in Figure 38 describes how Google's investment in Android was meant to ensure Google would not "get locked out!"[277]

[275] GOOGLE-00303922, at -4000.

[276] GOOGLE-00303922, at -3929, -4000.

[277] GOOGLE-00298438, at 449.

Figure 38: Android 101 Presentation (2008)[278]

211. Even after the launch of Android, Google's ability to attract sufficient scale was uncertain and the company remained focused on mobile. In 2010, Henrique de Castro, then-President of Mobile, also expressed the time sensitivity of building mobile share: "if we miss the 'mobile window', we'll be out of business in 10 years."[279]

b) Essential benefits of the Java API packages

212. The substantial benefits of the Java API packages were well understood by Google and articulated repeatedly in Google's internal correspondence during the early days of Android. In this section, I review the Java API benefits, both as articulated by Google in describing its decision to copy the Java API packages, and as described by technical experts Chris Kemerer and Doug Schmidt. The benefits of the Java API packages tie directly to Google's commercial requirements, including the ability to attract a large developer community, and a strong technical base for the Android platform within the wireless industry that already widely adopted and accepted Java.

[278] GOOGLE-00298438, at 449.

[279] GOOGLE-23-00000049.

(i) Attracting developers

213. As I discussed above, mobile phone usage is largely driven through apps, each of which is platform-dependent (e.g., an app for the iPhone will not run on the Windows phone without separate development). Because of that, a key pillar of Google's plan to use Android to grab a foothold in the mobile industry was attracting a large developer base to create apps for its platform quickly.[280] The Java developer community was particularly robust – numbering 6 million at the time of the Android launch. Copying the Java API packages provided Google a powerful means of accessing an app development community. They were already familiar with this easy-to-use application development framework and that familiarity enhanced their ability to quickly migrate to Android in that it made it easier for those developers to write new programs or to adapt existing ones. In sum, because of the large number of Java developers and because Java was "the #1 choice for mobile development," the Java API packages were an obvious choice for Android.[281]

214. Soon after acquiring Android, Google stated two particularly developer-centric reasons for its choice of the Java platform. (1) "Elegant [developer] tools story" and (2) "Existing pool of developers and applications."[282] Google's internal emails also indicated that Android needed access to Java developers, and that the Java APIs would attract those developers to the Android platform. Several examples of these exchanges are listed below.

- "The point of the language, VM, and library effort is to provide a familiar and useful set of functionality to developers…"[283]
- "[Java] provides a familiar interface for developers, making it easier for a seasoned Java developer to write original code or port existing code."[284]
- "Having [Java] familiar functionality available to developers … is one less distraction from the bona fide benefits of what we are trying to do."[285]

[280] *See* Email from Daniel Brunton to Chris Pruell et. al., Subject: Re: Game partner intro email list and form, Jan. 14, 2010, GOOG-00111128 (showing that Google Developer Relations team tried to reach out to application developers to get on the Android platform); *See also* TX 238 at GOOGLE-02-00071778 ("We enable developers who are familiar with programming in Java to leverage their skills to quickly build Android apps. The APIs in Android enable developers to build extremely capable mobile apps that can rival what can be done on a desktop . . .").

[281] GOOGLE-01-00019527.

[282] TX 1, p. 8. (GOOGLE-00001779)

[283] GOOGLE-24-00017719.

[284] GOOGLE-38-00127518.

[285] GOOGLE-02-00359548.

- "Java is more accessible than C++. There are more Java programmers. There is more standardization in tools and libraries. Debugging is much simpler (especially for people who are not total rock stars—perhaps a lot of casual developers, etc)."[286]

- "And, as with our rationale for including all the rest of the java packages, the reason for including this is because it is a platform-neutral (in terms of Android look and feel) set of classes which will make for a more familiar toolbox for developers."[287]

- "JavaOne is the largest developer conference of its kind and will bring together a very large number of developers who are very suitable for Android development. If there is any way we can hit them, it would be a good idea to try."[288]

- "writing great apps must be simple…
…we are building a java based system: that decision is final"[289]

(ii) Technical benefits of the Java API packages

215. In addition to providing a built-in base of 6 million developers,[290] the Java API packages enabled the Android team to quickly launch a technically stable product. The technical advantage afforded by using Java is referenced in several internal documents. For example, in an exchange between Android engineers, Senior Engineer Brian Swetland states, "java provides a nice safety net and faster app development and debuggability. (this is based on experience developing hiptop [a Java-based phone]—java saved us a pretty crazy amount of time)."[291]

216. Another engineer on the Android team, Chris Desalvo colorfully explained the importance of the Java API packages to the Android platform in a 2006 email to Andy Rubin: "With talks with Sun broken off where does that leave us regarding Java class libraries? Ours are half-ass at best. We need another half of an ass."[292]

217. Oracle technical expert Dr. Kemerer studied the Java API packages and found that they are significantly more "stable" than the early APIs that Google developed from scratch.[293] I understand from Dr. Kemerer that the term stable as it relates to a software platform expresses how much the code base

[286] TX 0013 (GOOGLE-01-00019511-513).

[287] GOOGLE-24-00138208.

[288] GOOGLE-01-00035931-933.

[289] TX 23, p. 1 (GOOGLE-04-00055098)

[290] GOOGLE-01-00025576. OAGOOGLE0004950038.

[291] TX 0013 (GOOGLE-01-00019511-513).

[292] TX 215 (GOOGLE-01-00081881).

[293] Expert Report of Chris Kemerer, January 8, 2016. P. 33-35

changes over time. Fewer changes mean more stable and easier to use API packages, which developers appreciate because it reduces the amount of new material they have to learn in order to successfully write applications. Stability therefore promotes developer efficiency, and as such more rapid development and application deployment. As Dr. Kemerer explains, stability is beneficial to developers because it makes a platform easier to work with, and therefore more attractive.[294] In his report, Dr. Kemerer concludes that the stability of the 37 copied Java API packages contributed to the significant growth of Android.[295]

2) Android revenues

218. As a result of Google copying the Java API packages to meet the commercial goal of quickly attracting a developer community and entering the mobile ecosystem at the critical point in time, Android has enjoyed great commercial success. This is evidenced by the significant revenues and profits Google has earned from the Android platform, as well as numerous Google documents and statements extolling the success and value of Android.

219. The commercial potential and success of Android (and mobile more broadly) was discussed often within Google. In a 2010 letter to the Board of Directors, Eric Schmidt writes, "[t]he opportunity in mobile is so large it's breathtaking—our mobile business more than doubled in the last year."[296] He later described Android's adoption and progress as "amazing by any standard" with "huge implications for Google," adding that "it looks as to me as though Android is well past escape velocity at every level." [297]

220. Another strategy document, entitled the "Mobile Display Ads Manifesto," similarly describes the massive commercial opportunity resulting from the combination of Android, Google's mobile ad network, and its ad serving products.

> We're sitting on one of the biggest commercial opportunities in the world…Publishers are moving en masse to phones and tablets, and ads will be one of the primary ways they will support their apps and content. Advertisers want to reach users wherever they are, and users are spending more and more time on tablets and phones. All the stars are aligned, and we're already on track to be a $1B (that's $1,000,000,000 or one thousand million dollars) run rate by end of 2011. But we're just getting started.[298]

[294] Expert Report of Chris Kemerer, January 8, 2016. P. 39

[295] Expert Report of Chris Kemerer, January 8, 2016. P. 39

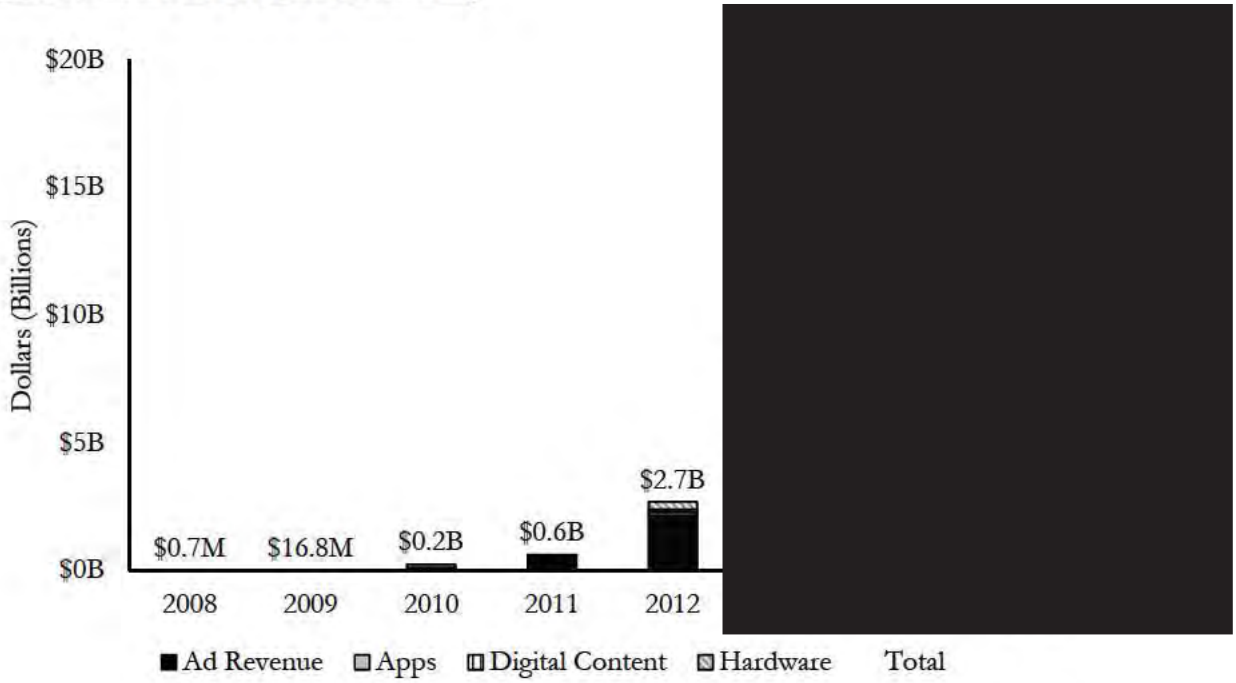
[296] GOOGLE-26-00025769.

[297] GOOGLE-26-00025769.

[298] GOOG-00273854, at GOOG-00273873.

221. Google makes money from the Android platform in four ways: ads served on Android devices, app sales,[299] digital content sales and hardware sales. Each of these revenue streams is shown in Figure 39 below. From 2008 to 2015, Android generated [redacted] dollars in revenue and approximately [redacted] in profits.[300] Figure 39 below shows the Android revenue from 2008 to 2015.

Figure 39: Android revenue (2008-2015)[301]



222. Figure 40, which is from a 2010 executive committee quarterly review, describes myriad financial and other benefits Google's business generates from Android.[302]

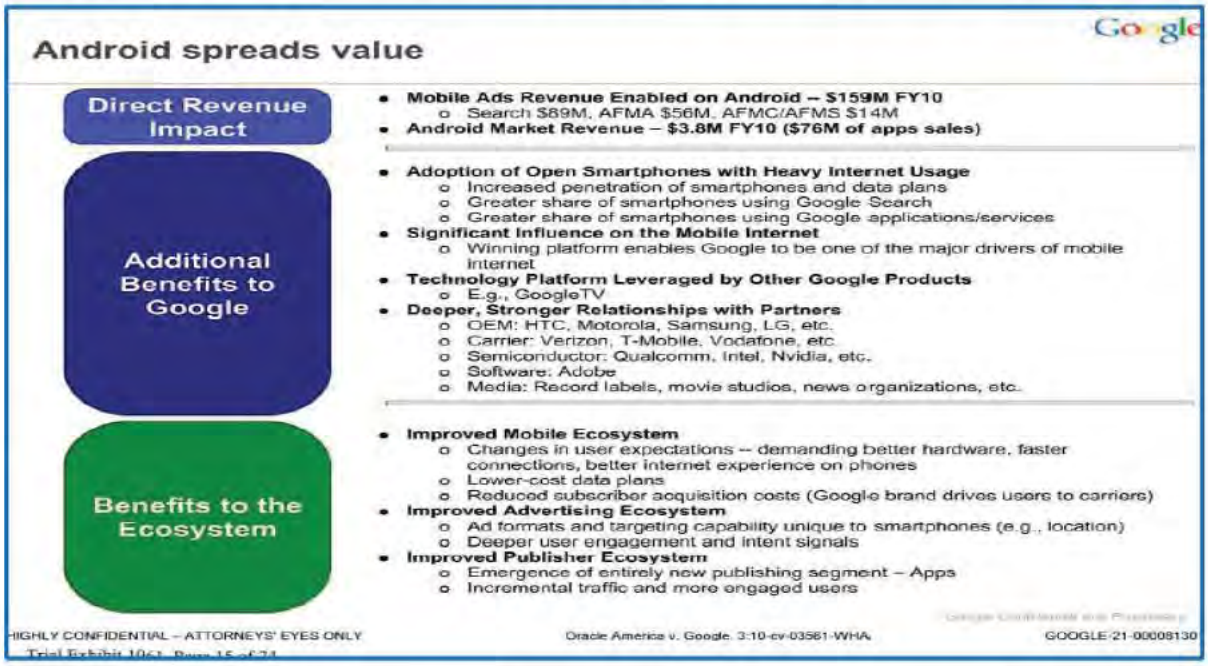
[299] In 2014, Google reported that it earned [redacted] in revenue, not including ad revenue, from the Android platform. This was a [redacted] over 2013 App Revenue, and a [redacted] compound annual growth rate from 2009. GOOG-00103813; GOOGLE-77-00053555; GOOGLE-01-00053552.

[300] GOOGLE-00303725 at 739; GOOGLE-01-00053552 at 556; GOOGLE-77-00053555 at 562; GOOG-00103813; GOOG-0002386; Google 2011 Form 10-K, p. 30 and 33; Google 2014 Form 10-K, p. 23 and 26; Exhibit 9; Keystone Analysis.

[301] GOOGLE-00303725 at 739; GOOGLE-01-00053552 at 556; GOOGLE-77-00053555 at 562; GOOG-00103813, See Exhibit 9.

[302] GOOGLE-21-00006051.

Figure 40: Operating Committee Quarterly Review – Description of Android Benefits (2010) [303]



223. Google readily promoted Android's role in ensuring its continued presence in mobile phone search and in driving revenue. On Google's Q2 2010 earnings call, Google's then-Senior Vice President of Product Management Jonathan Rosenberg answered a question about Android's "real installed-base revenue opportunity" as follows:

> I think the most important, the most obvious thing to think about from our perspective is what's the most popular app on these devices. The most popular app is a browser. And what do people do with the browser on these devices? They search an order of magnitude more than they have on any previous type of smartphones, which they'd had in years past. So the combination of people browsing on these smartphones connected on very, very fast networks and searching on them is basically the formula around how Google makes –how Google succeeds.[304]

Earlier in the same call, Google's Chief Financial Officer Mr. Pichette noted, "underpinning our growth [in mobile] is the success of the Android platform itself…[a]nd it creates an even larger base of data-centric smartphone users."[305]

[303] Trial Exhibit 1061 (GOOGLE-21-00006051).

[304] Google, Inc. Q2, 2010 Earnings Call, Thursday, July 15, 2010.

[305] Google, Inc. Q2, 2010 Earnings Call, Thursday, July 15, 2010.

a) Android ad revenue

224. Android's ad revenue is by far its most significant revenue stream. Google realized a total of [redacted] in Ad Revenue from Android devices between 2008 and 2015.[306]

(i) Ad monetization strategy

225. Generating Ad Revenue has been an important part of Google's Android strategy from the beginning. A 2009 Google internal presentation explains that "Android drives revenue through search ads – we enable a full web browser which can render desktop web pages . . . which means we can serve desktop ads."[307] Former Google CEO Eric Schmidt's testimony confirms this focus, "[t]he vast majority of Google's revenue at the time and today comes from search revenue. And so the primary reason to have something like Android is that people will do more searches, and then we'll get more money as a result. And that's how we, we essentially, pay for the strategy of Android."[308] Similarly, Tim Lindholm, a Google software engineer, wrote in a 2005 email that, with respect to Android, "Google's goal in this would be to create more mobile page views, from more compelling content, which will create more ad views. It's making a bigger, tastier pie."[309]

226. Google well-understood the particular value of search on mobile devices and the opportunities for monetization on Android. A 2009 Operating Committee Q1 2009 Quarterly Review presentation echoed this theme, stating "Search + Android = Huge."[310] According to this presentation, "[n]early 100% of our users have searched in the last 30 days. . . . 70% of all searches are initiated from Android search framework, rather than Google.com website" and the Search widget and browser search box drove 80% of Android revenue.[311]

227. As I describe above, Google's platform strategy monetizes services provided to consumers or partners by collecting data and selling advertising. Google executives confirm that Android follows this

[306] GOOGLE-00303725; GOOGLE-01-00053552; GOOGLE-77-00053555; GOOG-00132625; GOOG-00022386; Exhibit 9.

[307] GOOGLE-22-00060007.

[308] Trial Transcript 1458:12-16. Eric Schmidt also agreed that "the revenue that [Google] received as a result of the additional search revenue generated by Android paid for Android." *Id*. 1456:15-19.

[309] GOOGLE-12-00000115; GOOGLE-14-00042244 at 248.

[310] Advertising was also an explicit part of Google's licensing negotiations with Sun. In 2006, Google discussed the possibility of a co-development partnership with Sun under which Java technology would become an open-source part of the Android platform and which would include a negotiable share of revenue from "platform-enabled mobile ads." GOOGLE-00303725 at 731.

[311] GOOGLE-00303725 at 731; 739.

same playbook. When asked the question, "[w]ould it be accurate to say that the model Google has for Android is to make it available for free and to make money from advertising and the value-add services that go on top of the Android platform?" Eric Schmidt responded, "[t]hat's a component of our strategy, yes, and – yes."[312]

228. Many witnesses confirm the importance of ad revenue to Google's Android strategy. Daniel Morrill, Google's Android Compatibility & Open Source Program Manager, testified that Google's plan for generating profits from Open Source Android was that "the more people use the internet, the more they do searches, and the more they do searches, the more likely they are to use Google to do so and therefore create revenue for Google through advertising."[313] [314] Similarly, Google's Senior Director of Product Management Dipchand Nishar, testified that Google would benefit from Android because "[t]o the extent that the users of that platform would also adopt Google search and advertising . . . there would be monetary benefit to Google, if its advertising products are being used."[315] [316]

229. Google also viewed aspects of its Android ecosystem strategy as valuable to Google's long-term strategic goals. Nishar explained that, "[b]ecause of the goodwill being generated by having an open, free platform, as I said before, the carriers and OEMs, it would generate goodwill towards Google, and they would be more disposed to using Google's platform for search and advertising, yes."[317]

(ii) Ad revenue success and growth

230. Google's Android ad revenue strategy has been important to Google's financial success. A Q4 2010 presentation to the Google Operating Committee reports that "Android created a hardware and services ecosystem worth over $43B a year. . . . Our apps and ads services have made this [] possible, and

[312] Deposition of Eric Schmidt, August 23, 2011, p. 11.

[313] Deposition of Daniel Morrill, July 7, 2011, pp. 72 – 73.

[314] When asked whether "Google expected to profit from Android by increasing the number of people who were doing searches on Google's search engine?" Mr. Morrill answered "that's what we were told." Deposition of Mr. Daniel Morrill, July 7, 2011, pp. 72 – 73.

[315] Deposition of Dipchand Nishar, September 8, 2011, p. 96.

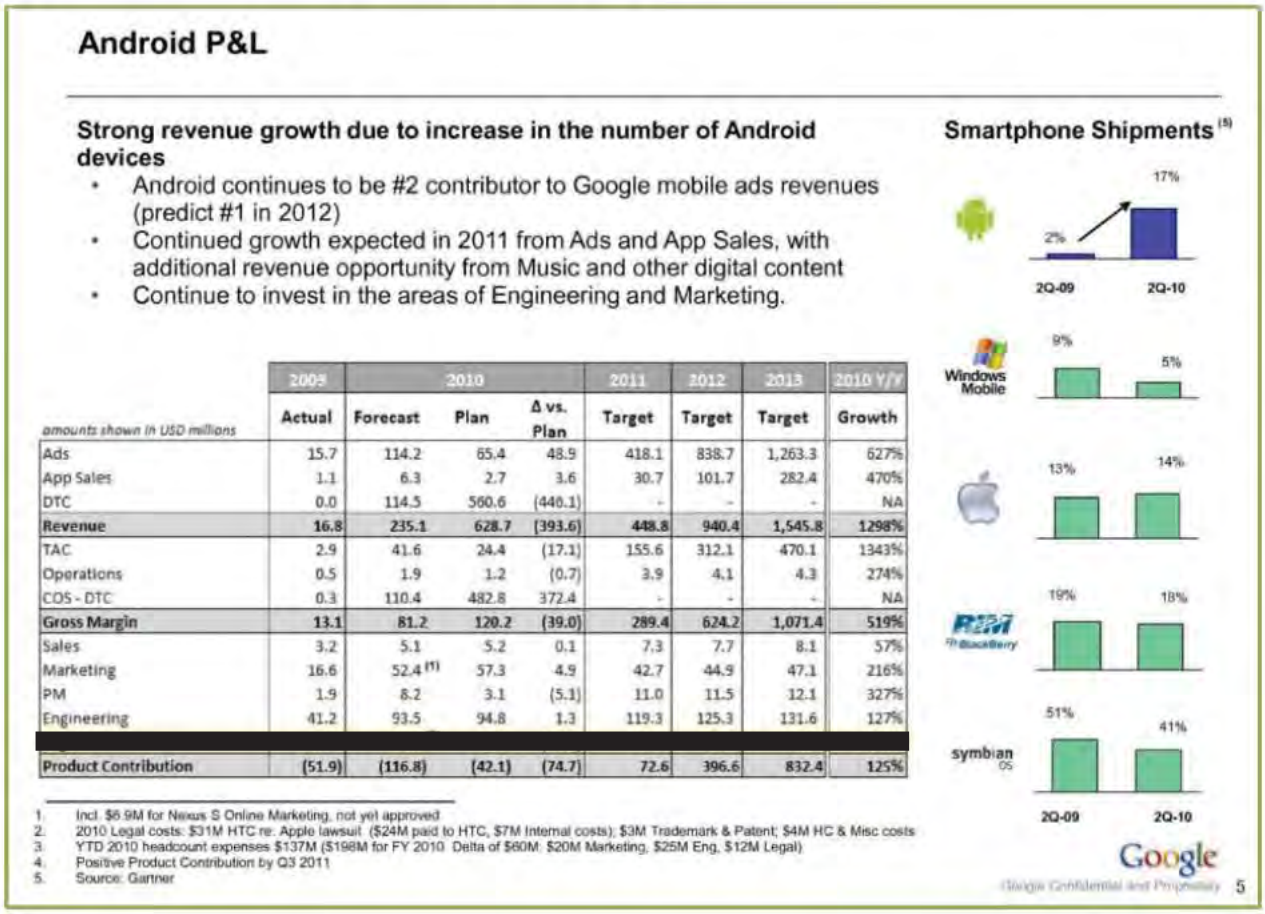
[316] Similarly, Aditya Agarwal testified that Google "generate[s] revenue from ads shown on Google Search on Android devices. . . . we make money off of ads on Google Search on an Android device. We make [money] off of ads revenues on Google Search on Android devices and from a very small share of money that we get from paid applications on Android Market." Deposition of Aditya Agarwal, April 8, 2011, pp. 24 – 27.

[317] Deposition of Dipchand Nishar, September 8, 2011, p. 96.

work to protect our position."[318] That same presentation predicted that Android Ad Revenue would increase from $115M in 2010 to $1.263B in 2013.[319]

231. Google's strategy to generate Android ad revenue has been extremely successful. Google replicated its proven playbook of building scale in a market and then monetizing its huge user base through advertising and sales of digital content (apps, music, etc.). Google's strategy was already gaining traction by the end of 2010.[320] Figure 41 below from a Q4 2010 presentation on Android to Google's Operating Committee shows Android's 2010 Profit and Loss statement.

Figure 41: Android Profit & Loss Statement (2010)[321]



Android P&L

Strong revenue growth due to increase in the number of Android devices

- Android continues to be #2 contributor to Google mobile ads revenues (predict #1 in 2012)
- Continued growth expected in 2011 from Ads and App Sales, with additional revenue opportunity from Music and other digital content
- Continue to invest in the areas of Engineering and Marketing.

amounts shown in USD millions	2009 Actual	2010 Forecast	2010 Plan	2010 Δ vs. Plan	2011 Target	2012 Target	2013 Target	2010 Y/Y Growth
Ads	15.7	114.2	65.4	48.9	418.1	838.7	1,263.3	627%
App Sales	1.1	6.3	2.7	3.6	30.7	101.7	282.4	470%
DTC	0.0	114.5	560.6	(446.1)	-	-	-	NA
Revenue	**16.8**	**235.1**	**628.7**	**(393.6)**	**448.8**	**940.4**	**1,545.8**	**1298%**
TAC	2.9	41.6	24.4	(17.1)	155.6	312.1	470.1	1343%
Operations	0.5	1.9	1.2	(0.7)	3.9	4.1	4.3	274%
COS - DTC	0.3	110.4	482.8	372.4	-	-	-	NA
Gross Margin	**13.1**	**81.2**	**120.2**	**(39.0)**	**289.4**	**624.2**	**1,071.4**	**519%**
Sales	3.2	5.1	5.2	0.1	7.3	7.7	8.1	57%
Marketing	16.6	52.4 (1)	57.3	4.9	42.7	44.9	47.1	216%
PM	1.9	8.2	3.1	(5.1)	11.0	11.5	12.1	327%
Engineering	41.2	93.5	94.8	1.3	119.3	125.3	131.6	127%
[redacted]								
Product Contribution	**(51.9)**	**(116.8)**	**(42.1)**	**(74.7)**	**72.6**	**396.6**	**832.4**	**125%**

1. Incl. $6.9M for Nexus S Online Marketing, not yet approved
2. 2010 Legal costs: $31M HTC re: Apple lawsuit ($24M paid to HTC, $7M Internal costs); $3M Trademark & Patent; $4M HC & Misc costs
3. YTD 2010 headcount expenses $137M ($198M for FY 2010 Delta of $60M: $20M Marketing, $25M Eng, $12M Legal)
4. Positive Product Contribution by Q3 2011
5. Source: Gartner

Smartphone Shipments [5]

Google

Google Confidential and Proprietary 5

Figure 41 above also shows that in 2010, Android's ad revenue significantly outpaced Google's plan.

[318] GOOGLE-01-00053552 at 566.

[319] GOOGLE-01-00053552 at 585. Actual Android ad revenue far exceeded these estimates – 2013 totals were [redacted] See Exhibit 9.

[320] GOOGLE-01-00053552, at -3556.

[321] GOOGLE-01-00053552, at -3556.

232. In the next quarter (Q1 2011), Google's Operating Committee noted that Android annual revenue was higher than all other high-end phone platforms in the United States and Japan.[322] Google also increased its Android Ad Revenue projections from the Q4 2010 presentation. For example, its projection of 2013 revenue increased from $1.263B to $1.715B.[323]

233. In the Q2 2011 Earnings Call, Google executive Nikesh Arora emphasized the continued growth in Android ad revenues, "our Mobile business continues to be another area of robust growth. The number which Larry just shared of 550,000 Android, that and the success of smartphones and general Mobile Data devices around the world is acting as an accelerator for our mobile advertising effort."[324] In the Q3 2011 Earnings Call, Arora summarized the growing import of Android to Google's revenue, "Many advertisers have greatly increased the size and frequency of their mobile campaigns. Mobile is becoming a must-have."[325] That same year, Piper Jaffray released an analysis of Google's Android business entitled "Android likely a $1 Billion Business Next Year for Google." Consistent with the title, the firm's view of Android's revenue generation prospects was positive, "As consumer time spent on mobile devices continues to increase, we expect the [Average Revenue Per User] on mobile could eventually reach those of Google's online businesses."[326]

234. By 2012, Google's internal reporting, as shown in Figure 42 below, was showing trailing 12-month revenue of $1.65B, a sizable increase over projections.

[322] GOOGLE-77-00053555.

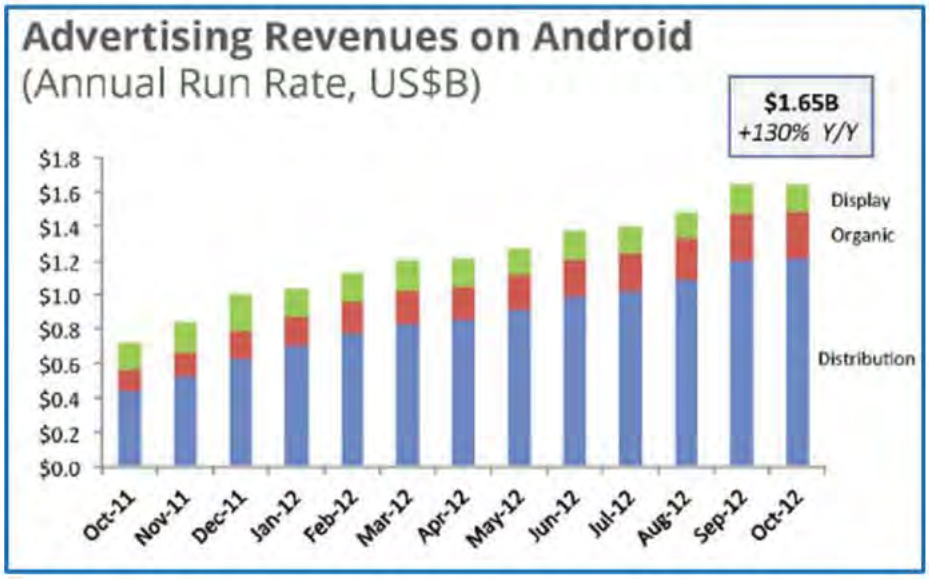
[323] GOOGLE-77-00053555.

[324] Google Inc. Q2 2011 Earnings Call Transcript, p. 6.

[325] In the Q3 2011 Earnings Call, Google executive Nikesh Arora "Let's turn to mobile advertising. Larry mentioned $2.5 billion as a run rate. Our revenue growth continues to accelerate even in Mobile, driven primarily by mobile search. This growth, obviously, is driven both by the underlying expansion of Android devices and of tablets, as well as stellar performance of our sales teams who are working closely with our customers to help them craft compelling mobile advertising solutions." Google Management Discusses Q3 2011 Results – Earnings Call Transcript, October 13, 2011, p. 6.

[326] Piper Jaffray Report, "Android likely a $1 Billion Business Next Year for Google," February 8, 2011.

Figure 42: Android Advertising Revenues – Annual Run Rate (2012) [327]



About six months later, in a March 31, 2013, "Android Weekly Metrics Summary," Google reported that Android search revenue was at about [redacted] far exceeding its earlier projections. [328] Tracking Google's internal reporting of Android ad revenue reveals that Google enjoys significant and growing financial benefits as the Android platform expands.

235. As recently as 2015, an internal Google presentation reports continued growth of Android. As Figure 43 from that presentation shows, between January 2014 and April 2015, Android ad revenue increased from [redacted] to [redacted] per month.[329]

[327] GOOG-00132218.

[328] GOOG-00290796. In November 2013, Google estimated that the incremental gross margin was [redacted] per phone and [redacted] per tablet. As I discuss below, this increased profit measurement estimate increased in later years. GOOG-00186877.

[329] GOOG-00130338.

Figure 43: Android Monthly Search Revenue (2014-2015) [330]

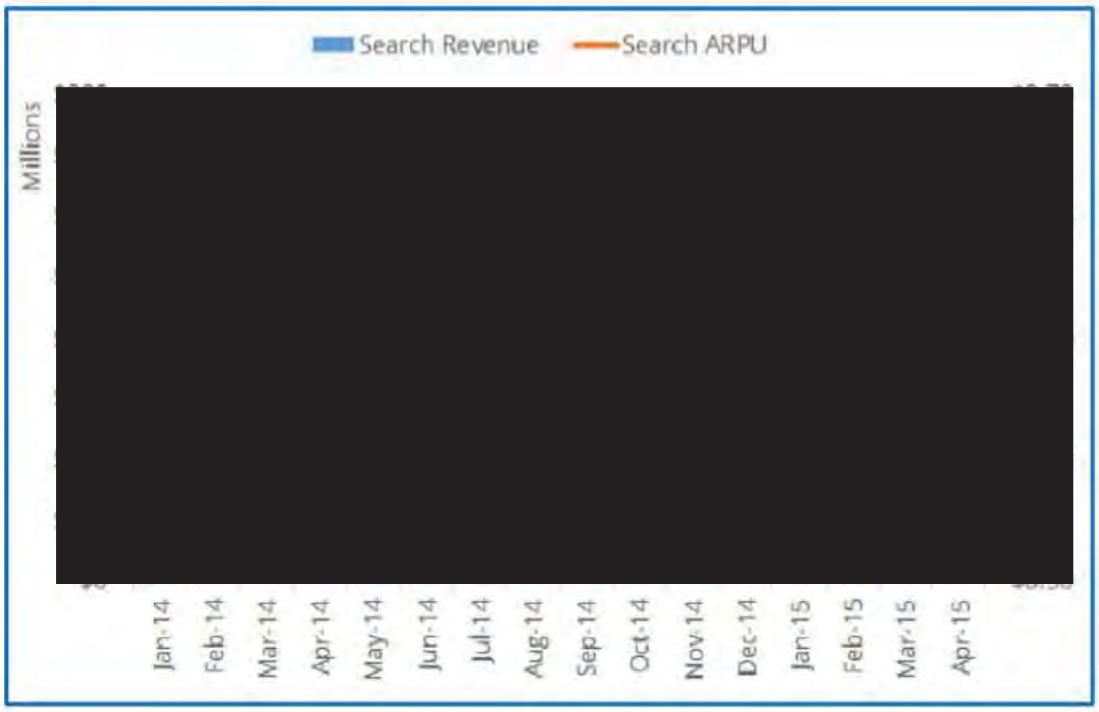


Figure 43 above also measures "ARPU" on the right-side Y-Axis. ARPU stands for average revenue per user and is an important companion metric because it measures growth within Google's ad monetization engine while controlling for the overall growth of its network.

236. In April 2015, Forbes wrote an article about Google ad revenue noting that "[t]he mobile search ads division is the second largest division for Google and makes up approximately 34% of its total value, according to our model. Google, with 90% market share, dominates the mobile search engine market. One of the key reasons for this dominance is its flagship Android OS, which has witnessed excellent adoption and penetration in the smartphone space."[331]

b) Google Play Store

237. Google's next largest source of Android revenue comes from direct sales to Android users through its Google Play Store.[332] Today's Android Google Play Store launched as the "Android Market" in 2008. Its role on the Android platform remains the same—to provide Android users with a source for

[330] GOOG-00130338.

[331] *"Google Earnings Preview: Will Advertising Revenue Grow?,"* Forbes, April 22, 2015. http://www.forbes.com/sites/greatspeculations/2015/04/22/google-earnings-preview-will-advertising-revenue-grow/.

[332] "Google Play store" and "Android Market" are used interchangeably here.

the download of apps and digital content such as music, movies and e-books.[333] Google's 2013 10-K describes the Google Play Store as an "entirely cloud-based, digital entertainment store with more than a million apps and games plus millions of songs and books and thousands of movies that our users can find, enjoy and share on their computer, phone or tablet."[334]

238. Google generates significant Android revenue directly from the Google Play Store. Jon Gold, Android's Senior Financial Director testified that Google Play is a "commercial opportunity for Android" and that Google "make[s] money" from it.[335] From 2012-2013, Google's "Other Revenue" increased by $2.6 billion and Google attributed the increase "to growth of our digital content products, such as apps, music, and movies on the Google Play store."[336] Similarly, Google's "Other Revenue" increased another $2.0 billion between 2013 and 2014.[337] Again, Google explained that this was "primarily due to growth of our sales of digital content products, such as apps, music, and movies on the Google Play store."[338]

239. Google generates Android revenue through its Google Play Store in two ways: (1) sales of app downloads (including in-app purchases), and (2) sales of downloaded digital entertainment content. I discuss each in turn.

(i) Android revenue from app downloads

240. Google views both app availability and app sales to Android users through the Google Play Store as important elements of Android platform monetization.[339] Since its launch, there have been over 100 billion app downloads by Android users through the Google Play Store.[340] During the same period, Android's Google Play Store has generated a total of [redacted] in revenue from app downloads and in-app purchases.[341]

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[333] http://www.cnet.com/news/google-reboots-android-market-launches-google-play/.

[334] Google 2013 Form 10-K, p. 3.

[335] Deposition of Jon Gold, January 29, 2016 at 414:20-415:4.

[336] Google 2013 Form 10-K, p. 24.

[337] Google 2014 Form 10-K, p. 24.

[338] Google 2014 Form 10-K, p. 24.

[339] GOOGLE-00302808. To ensure the success of the Google Play store, Google believed it would need a "strong network of partners distributing Market in devices" and therefore agreed to share 70% of revenues generated by app sales with developers.

[340] Google Inc (GOOG) CEO Discusses Q2 2013 Results – Earnings Call Transcript, July 18, 2013, http://seekingalpha.com/article/1557292-google-inc-goog-ceo-discusses-q2-2013-resuts-earnings-call-transcript; Google Play on more than 50 billion installs in the past year, over one billion active users, May 28, 2015, http://www.androidcentral.com/google-play-sees-more-50-billion-installs-past-year-over-one-billion-active-users.

[341] GOOGLE-01-00053552 at 556; GOOGLE-77-00053555 at 562; GOOG-00103813.

241. Google Play Store app downloads grew quickly after its launch. During the first quarter of 2009, Google reported that there were 2,700 apps and 43 million app downloads.[342] 85 percent of Android users had downloaded at least one app.[343] By the end of 2010, there were 33,000 paid apps and 86,000 free apps available to download from the Google Play store.[344] This number increased to 117,500 free apps and 74,500 paid apps by March 2011.[345]

242. Google viewed app availability as important to the health of its mobile ecosystem and to Google's partners. In an internal document, Google explained why the volume of apps is important to its strategy, saying "[w]e created the first app store for Android and it got critical mass quickly. The store now has value and partners want access to it because of the number of apps available."[346] Apps play a role in winning user loyalty to the platform.[347] Analysts have also noted the importance of Google Play revenues. A 2015 Trefis report summarized as follows:

> The Google phone division makes up 10.5% of its estimated value. Considering the growth of Google's Android platform and the growth in smartphone adoption globally, Google's Play store is fast becoming a vital cog for Google's growth in the coming years. Google Play is also connecting developers and content providers with more than 1 billion people on Android devices around the world. Developers are building thriving businesses in this platform, and in February, Google announced that over the past 12 months (FY 2014), it paid more than $7 billion to developers.[348]

(ii) Android revenue from digital content

243. Android's Google Play Store also generates revenue through sales of digital content such as - books, music, videos, and magazines.

244. Android's digital content offerings in its Google Play Store have evolved and revenue has grown considerably since its launch. In Q4 2010, Android introduced downloadable music and "Other Digital

[342] GOOGLE-00303725 at 745.

[343] GOOGLE-00303725 at 745.

[344] GOOGLE-00395207.

[345] GOOGLE-77-00053555.

[346] GOOGLE-01-00053552 .

[347] Google Launches Android Market, http://www.techhive.com/article/152613/google_android_ships.html; Do App Stores Impact Wireless Device Sales?, October 18, 2010, https://www.strategyanalytics.com/strategy-analytics/blogs/media-services/media-services-ux/media-and-services-ux/2010/10/18/do-app-stores-impact-wireless-device-sales-#.Vh0dY_lVhBc.

[348] Trefis Analyst Report, "Google Earnings: Profits Soars as the Company Reins in Cost," July 17, 2015.

Content."[349] In 2012, Google reported a $189 million annual run rate for digital content downloads.[350] In 2015, an internal Google presentation reported that Digital Content generated [redacted] in revenue in 2013, [redacted] in revenue in 2014, and [redacted] million in revenue in 2015.[351] Overall, from 2011 and to 2015, Google has generated [redacted] in revenue from sales of Android-based digital content sales.[352]

245. Android's revenue from digital content sales is expected to continue to grow. A 2015 Forbes article reported that "[c]onsidering the growth of Google's Android platform and the growth in smartphones adoption across the globe, Google's Play store is fast becoming a vital cog for Google's growth in the coming years. . . . We believe that Google will be able to leverage popularity of Android platform to boost its revenues. Currently, we forecast digital content revenue to grow to $8.51 billion by the end of our forecast period."[353]

c) Google Hardware Android revenue[354]

246. In 2010, Google released the Nexus, an Android platform mobile device for which Google received direct sales revenue. Since then, Google has released an array of Nexus-branded Android platform mobile devices including phones, tablets, watches, and accessories in partnership with various OEMs including Samsung, HTC, LG, and Motorola. In aggregate, Google's sales of hardware total approximately [redacted] since 2010.[355]

d) Overall Android growth

247. As one would expect, Android device shipments have experienced similarly rapid growth. Figure **44** below shows the number of Android phones and tablets shipped in each year.

[349] At the time, Google expected these downloads to generate between $1.5 and $3 billion in revenue by 2013. GOOGLE-01-00053552 at 567.

[350] GOOG-00132218 at 223.

[351] GOOG-00130338 at 342.

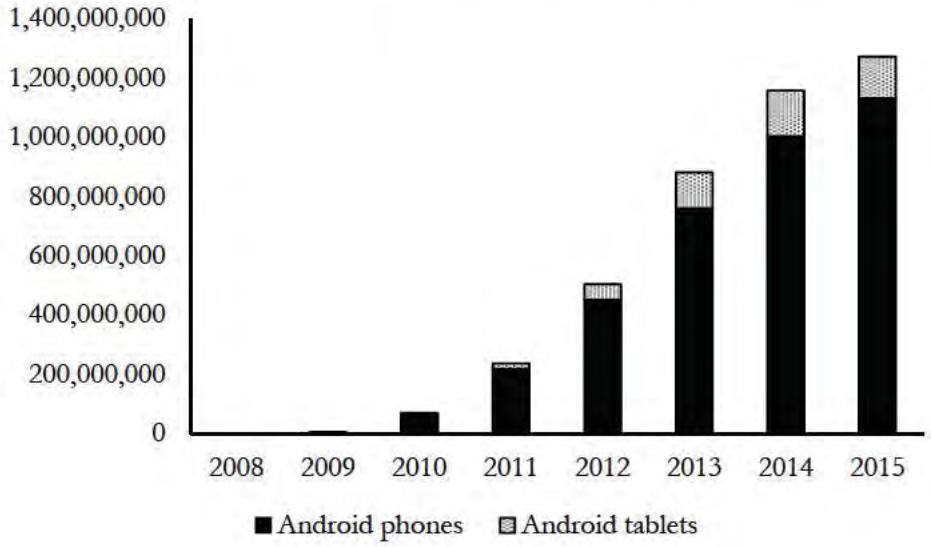
[352] GOOG-00103813.

[353] "Google Earnings Preview: Will Advertising Revenue Grow?," Forbes, April 22, 2015. http://www.forbes.com/sites/greatspeculations/2015/04/22/google-earnings-preview-will-advertising-revenue-grow/.

[354] The Java API packages get loaded onto Google hardware; and so Google commercially exploits Oracle's copyrighted works in hardware as well. (Expert report of Robert Zeidman, Jan. 8, 2016).

[355] Deposition of Jon Gold, December 11, 2015, p. 70; GOOGLE-77-00053555; GOOG-00103813.

Figure 44: Android shipments – phone and tablet (2008-2015)[356]



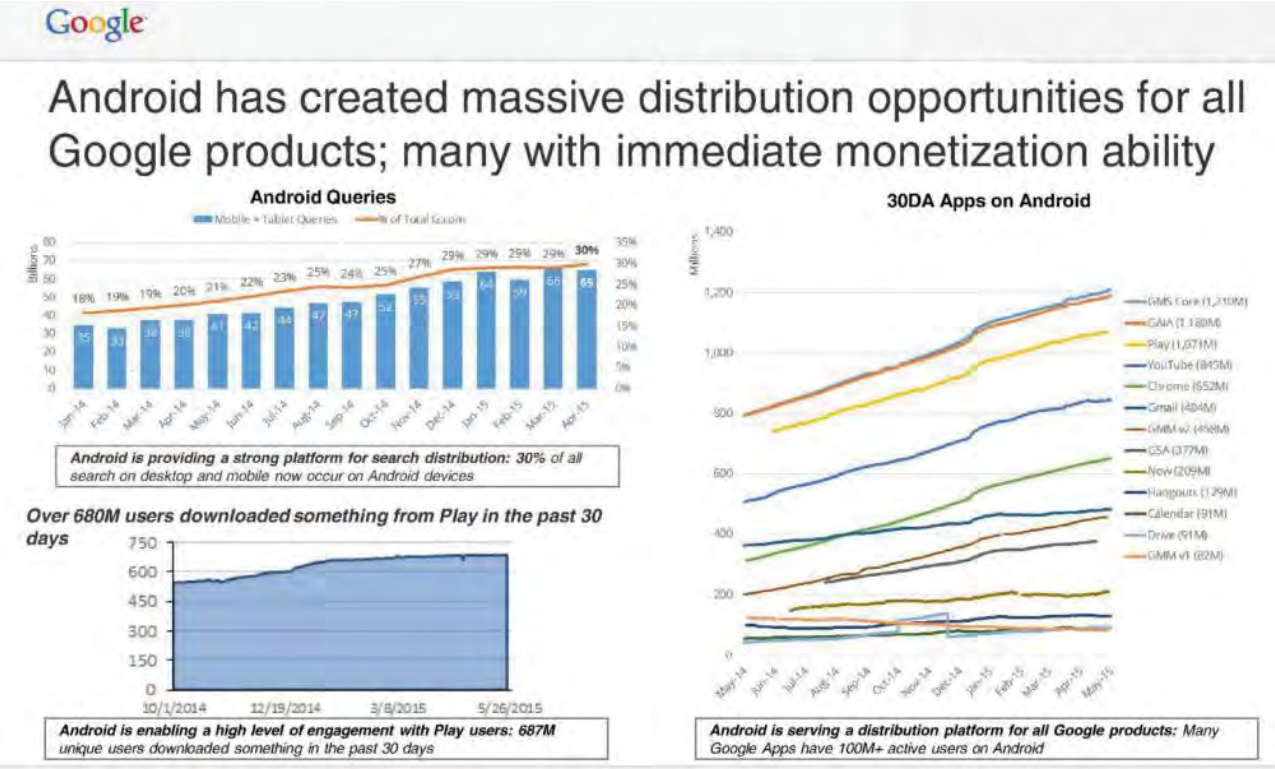
248. This massive growth of Android devices has resulted in Android enjoying an 83% share in the smartphone market today.[357] Android's huge user base is extremely valuable to Google as a distribution channel for the products it directly monetizes. In 2013, Google formed a dedicated team to "improve the interface between the Android and Ads team" that Andy Rubin announced will make Google "lots of money."[358] Figure 45 below from an internal presentation for Google executives shows the way the Android finance team perceives this distribution value.

[356] Exhibit 3.

[357] Exhibit 3.

[358] GOOG-00570823, at -0823. *See also* GOOG-00112576.

Figure 45: Introduction to Android presentation (2015)[359]



249. In the same presentation, Google's finance team estimated the value of an Android user. As of 2015, Google estimates the lifetime value to Google of a single Android user as approximately [redacted] in profits (assuming repeat device purchasing).[360] There were about 1.4 billion Android users as of September 2015.[361]

250. The importance of Android in leveraging Google's multiple revenue streams is brought home by Google's requiring OEMs who ship Android phones pursuant to the Mobile Application Distribution Agreements to bundle Google apps such as Google Maps and YouTube with the Android operating system in such a way that the phone user cannot de-install those apps.[362] The Google apps are proprietary and are not licensed as part of the open source platform (called "AOSP"). The only reason for Google to impose the no de-install requirement is to protect revenue opportunities associated with those apps.

[359] GOOG-00130338 at 346.

[360] GOOG-00130338 at GOOG-00130343.

[361] Lomas, Natasha. "Android Now Has 1.4 Billion 30-Day Active Users Globally." *Techcrunch*

[362] Hill, Brandon. Google to Require as Many as 20 of its Apps to be Preinstalled on Android Devices. Daily Tech (Sept. 26, 2014). http://www.dailytech.com/Google+to+Require+as+Many+as+20+of+Its+Apps+to+be+Preinstalled+on+Android+Devices/article36620 htm.

According to another Google executive responsible for its Android hardware partnerships, none of the OEMs use just the AOSP software.[363]

251. Google executives have acknowledged the profitability of Android on many occasions. For example, Google CEO Eric Schmidt noted in Google's Q3 2010 earnings call that "Android is hugely profitable," and that "Android is well past anything that I had ever hoped for and looks like it's on its way to be a huge, huge, success."[364]

252. Two years later, on its Q3 2012 Earnings Call, Google again touted the robustness of Android's success, saying, "mobile search queries and mobile commerce are growing dramatically across the world"[365] and "[w]e continue to see great momentum in our mobile advertising business and opportunities with brand advertisers."[366] In that call, Larry Page said:

> This time last year, I announced that our run-rate for mobile advertising hit $2.5 billion. That seemed like a pretty big number even for Google. But now we have built up additional mobile revenue from users paying for content and apps in Google Play. Including these new sources grossed up, I can announce our new run-rate for mobile is now over $8 billion. That's quite a business.[367]

253. In sum, there is overwhelming and consistent evidence of Android's robust performance in service of Google's revenue and strategic goals across four primary revenue streams: ads, Google Play Store, digital content and hardware sales.

3) Continued strategic importance of Android to Google

254. Google's Java-based Android platform is a significant source of Google's revenue and provides Google with a critical distribution channel for a range of Google search and other advertising services. Android protects and reinforces Google's scale advantages, network effects and control as a dominant advertising platform.

255. The high-level strategic importance of Android was highlighted in a May 2015 presentation prepared to introduce incoming Chief Financial Officer Ruth Porat to the Android business. The Android

[363] Deposition of Hiroshi Lockheimer, December 8, 2015, p. 171-172:10-18.

[364] Google Q3 2010 earnings transcript at p. 10.

[365] Google Q3 2012 earnings transcript at p. 2.

[366] Rachel King, Google's Q1 Earnings Results Also Plagued by Strong Dollar, ZD Net (Apr. 23, 2015), http://www.zdnet.com/article/google-q1-2015-earnings-revenue-by-the-numbers/.

[367] Google Q3 2012 earnings transcript at p. 2.

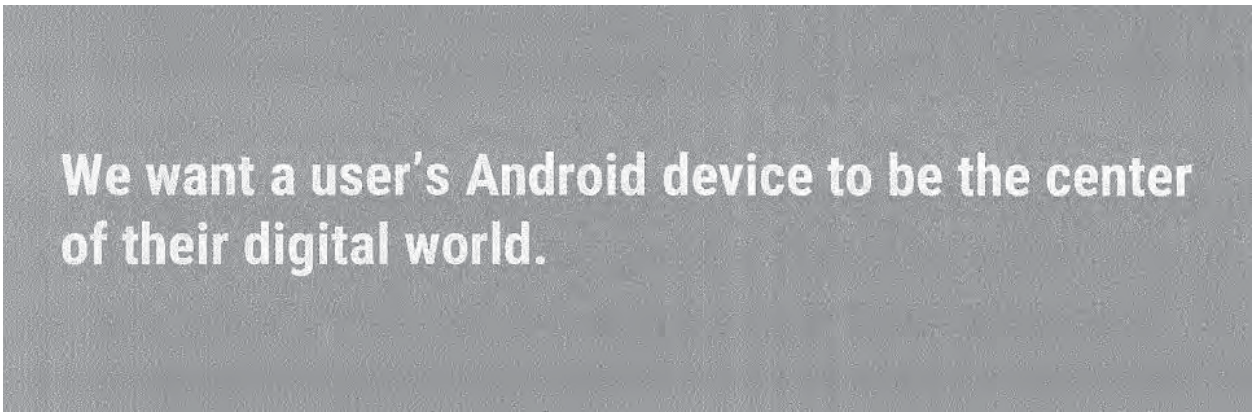
finance team summarized the key financial value propositions of the Android platform with a series of projections (that turned out to under-estimate performance) excerpted below:[368]

- Android Ecosystem is central to Google's success over the next 3-5 years
  - In 2015, [redacted] of revenue will occur on the Android Platform -- [redacted] of direct revenue from Play and Hardware Sales; with an additional $10B (+72% YoY) of revenue from Ads on Android.
  - The [Android] platform is critical for distribution of all of our products, driving activations and usage at relatively low incremental cost.
    …
- With the overarching goal of building a sustainable platform to act as a delivery mechanism for Google software and services, the team has been successful executing against ambitious new programs of varying scale.[369]

a) Android as a Gateway

256. One of the ways in which Google protects its scale is by ensuring users can access Google services across a broad range of devices. Android sits at the center of this strategy. For example, a Google internal presentation, entitled "Android: the center of all your devices," includes a simple slide illustrating how Google views the role of Android, as shown in Figure 46 below.[370]

Figure 46: Android Presentation (April 2015)[371]



257. Competition among platform providers increasingly requires companies to cater to users' desires for a single, integrated platform across mobile devices, smart television, wearables, and other connected

[368] Deposition of Jonathan Gold, December 11, 2015. p. 177:10-24; GOOG-00130338, at -0339.

[369] GOOG-00130338, at -0339.

[370] GOOG-0025-1037

[371] GOOG-0025-1037, at GOOG-0025-1039

home devices.[372] The mobile device serves as the key gateway to owning the suite of user experiences. A recent story referred to this strategic imperative, "A host of hardware and software companies have been vying for the coveted "gateway" spot—the main device or application with which users watch their video content, whether it's on the TV or the smartphone."[373]

258. Google Senior Director of Android and Chrome OS partnerships, James Kolotouros, described the importance of expanding into new Android markets in his deposition:

> Q: Why is the television market important to Google?
>
> THE WITNESS: [E]cosystems are expanding to include additional form factors, and at the same time as competitors are looking to expand into other segments, it is my belief that, for Android to be successful, not just being in phones and tablets is important.[374]

Later in his deposition Mr. Kolotouros explained Google's sales strategy in servicing large, multi-product OEM accounts.

> A: What were your responsibilities in working with Thomas [business development employee for Android TV]
>
> A: …Coordinating across OEMs who might have been not just Android TV partners, but [also] Android smartphone or tablet manufacturers.
>
> Q: What does that coordination involve?
>
> A: Primarily making sure that we're doing our best to work well with the OEM and work efficiently with them so that…they have an efficient interaction with Google and … have better prospects for success.
>
> …
>
> [redacted]

259. The statements above illustrate that Google depends upon Android for its success in mobile search and its overall ecosystem health, revenue and profits.

---

[372] Deposition of Felix Lin, December 18, 2015. P. 249:15-251:6.

[373] Thibeault, Jason. Why Apple, Microsoft, or Amazon Will Win the the Living Room, Streaming Media (Jan. 2016), http://www.streamingmedia.com/Articles/Editorial/Featured-Articles/Why-Apple-Microsoft-or-Amazon-Will-Win-the-the-Living-Room-108553.aspx.

[374] Deposition of James Kolotouros, January 26, 2016. P. 71:21-25, 72:1-19.

[375] Deposition of James Kolotouros, January 26, 2016. P. 75:10-14.

b) Importance of scale and necessity of competitive counterbalance

260. My analysis of Factor 1 seeks to understand the degree of commerciality of Google's copying of the Java API packages. As I discuss throughout this report, that is best understood through the lens of Google's platform business, which requires, among other things, mobile search scale. In this section, I describe the substantial investment Google makes for mobile search traffic on platforms it does not control like iOS and others. I also discuss how Android's search traffic serves as a counterbalance in its dealings with non-Android distribution partners. These analyses reveal the long-term strategic and the short-term financial benefits afforded to Google by the Android platform, and demonstrate the high degree of commerciality involved in Google's copying of the Java API packages.

261. The scale that Google needed for its mobile ecosystem requires significant investment in the form of revenue sharing with OEMs and carriers. As I explained above, the reason why Google enters into such seemingly costly distribution arrangements is the need for scale. In PC search, Google initially built scale through distribution and syndication partnerships. Once it achieved success, it then worked to reduce dependence on partners by promoting consumer use of its owned and operated sites and services (*e.g.*, the Google portal, YouTube) over use of sites controlled by its partners. This "Google-owned" traffic is preferable because it means Google does not have to share the associated ad revenue with any partners. The economic incentives at play in the mobile advertising space are similar. Scale and timing are important, particularly in the early stages of development of the market for a network good. Google needed to expand its presence in mobile quickly to avoid being locked out, so Google built scale through revenue-sharing agreements with its partners.

262. Figure 47 below from an internal Google presentation on mobile shows the range of OEMs and carriers to which Google made revenue sharing payments for distribution.

Figure 47: Google Payments to Mobile Ecosystem Partners (2011)[376]

Search: Mobile Distribution TAC % primarily impacted by Apple (3/4 of Mobile Search TAC $s) and Carriers

	Q3'11		$M				% of Total		
	Partner	OEM/CARRIER	Dist+Org Rev	Dist Rev	TAC	TAC%	Dist+Org Rev	Dist Rev	TAC
1	[redacted]								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
	Total	-	[redacted]						

Google has publicly proclaimed that Google's strategy for Android is a "volume" play, one of "mass penetration." This characterization by former Google CEO Eric Schmidt was further articulated in a 2014 article:

> The fact of the matter is you can make a small market share with a lot of profits, or you can make the same amount of money with a much larger market share, and lesser profits. We go for volume in our strategies.

263. Android provides a key counterbalance to partners and competitors in its platform markets. Over the course of a decade of PC growth, the Google playbook that I describe above put Google in a position where it had significant control of its ecosystem through its owned and operated sites. Mobile presented Google with a new set of partners—OEMs, carriers, chipmakers, developers–any of whom could have challenged Google's control.

[376] GOOG-00248717, at -8739.

264. I understand that Google provided a chart listing the historical mobile search revenue that Google generated through its distribution arrangements, with "non-Android" mobile (and in one case, mobile and PC) search distribution partners.[377] Though the identities of the partners are obscured (called "Partners A-F"), these search revenue sharing payments provide an important view of the amount that Google invests in building scale on mobile devices, and the amount of revenue that investment yields.[378] Finally, the magnitude of Google's TAC payments provides further evidence of the incentives that Google had to gain greater share of mobile search through Android. As I discuss above, gaining control provides a platform, among other things, and a better ability to price optimally.

265. The information provided includes search revenue and revenue sharing percentage by year, for each listed partner.[379] From this information, I calculated total TAC payments to each partner by year. In Table 6 below, I show the magnitude of revenue and payments over time for Partners B-F.[380] Only mobile revenue is indicated for each of these Partners.[381]

Table 6: Google TAC Payments to Partners B – F (in millions)[382]

	Partner B			Partner C			Partner D			Partner E			Partner F		
Year	%	Rev	TAC	%	Rev	TAC	%	Rev	TAC	%	Rev	TAC	%	Rev	TAC
2006															
2007															
2008															
2009															
2010															
2011															
2012															
2013															
2014															
2015															

As is clear in Table 6 above, Google invests substantially to secure mobile search distribution on platforms other than Android. And that investment returns significant revenues. This shows the importance of securing distribution and the benefits of achieving scale.

[377] Dkt. 1436.

[378] Dkt. 1436.

[379] Dkt. 1436.

[380] Dkt. 1436.

[381] Dkt. 1436.

[382] Dkt. 1436.

266. The data for Partner A is particularly instructive because the partner has both a PC and mobile search distribution agreement with Google. By analyzing the trend in TAC payments for mobile versus PC search, I am able to infer the relative importance of the two categories. Figure 48 below shows the TAC that Google has paid to "Partner A" since 2005.

Figure 48: Google TAC payments to "Partner A"[383]

267. The chart above illustrates two important facts for understanding the monetary and strategic value that Java-based Android provides to Google. First, I observe that the amount of search revenue (and TAC payments) for Partner A are growing much more rapidly than for the PC, suggesting the key area of growth for Google's advertising business is mobile. It is in Google's economic interest to avoid reliance on distribution partners in the growing mobile market, and Android provides a mechanism for reducing reliance on non-Android partners whom Google does not control. Second, I see that the overall magnitude of the payments, nearly [redacted] for mobile TAC in 2015 alone is high.[384]

268. Google's most significant risk to its mobile success has always been Apple. The Android platform provided Google the best chance to counterbalance competing ecosystems and grow its own platform that it would control. At the time Google was developing its mobile strategy built around

[383] Dkt. 1436.

[384] Dkt. 1436.

Android, Google temporarily avoided lockout by securing an important partnership with Apple. However, Google remained highly focused on building mobile share through Android over which it had more control. As I explain above, since 2007, Google has provided search services to Apple for its iOS devices. This arrangement with Apple comes with significant revenue sharing costs and more importantly, creates a major strategic vulnerability for Google because of the amount of search, app traffic and dollars flowing to Google through Apple's iOS devices. Android provides an important counterweight to the power of iOS mobile traffic by reducing Google's TAC payments, the threat of a sudden loss in search volume and the disintermediation of other Google services. In this section, I describe how Android alleviates each of these competitive disadvantages below.

269. Google has paid [redacted] of dollars in [redacted].[385] The level of [redacted] is discussed in a number of Google internal documents. For example, a record of meeting notes from a Google Mobile meeting in January 2012 reports the [redacted]."[386] Another presentation entitled, "Impact of Mobile on Google.com Growth & Margins" states, [redacted] Android Finance Director Jonathan Gold confirmed the significance of Google's payments to [redacted]:

> Q: [W]hat is the percentage of that revenue that is paid out to Apple?
>
> A: It is -- it's roughly [redacted].[388]
>
> A: In the lifetime of payments to Apple, it's certainly been more than a billion dollars.
>
> Q: In fiscal year 2014, do you believe that that revenue share totaled more than a [redacted]
>
> A: Sitting here today, I don't know the specifics, but that's the ballpark.[389]

270. Google's willingness to make payments of this size is another indication of the value it places on dominance of the search market, and the importance of mobile phones in maintaining that dominance.

[385] GOOG-00273770, at -774.

[386] GOOG-00248660.

[387] GOOG-00273770, at -774.

[388] Deposition of Jonathan Gold, December 11, 2015, p. 17.

[389] Deposition of Jonathan Gold, December 11, 2015, p. 14.

Recall that in Google's distribution arrangements, Google pays a partner (such as Apple) to be the default search engine for various search access points (such as the Safari browser on an iPhone). User searches from these access points return both Google search results and Google search ads, and Google pays partners a portion of the revenue derived from the ads.

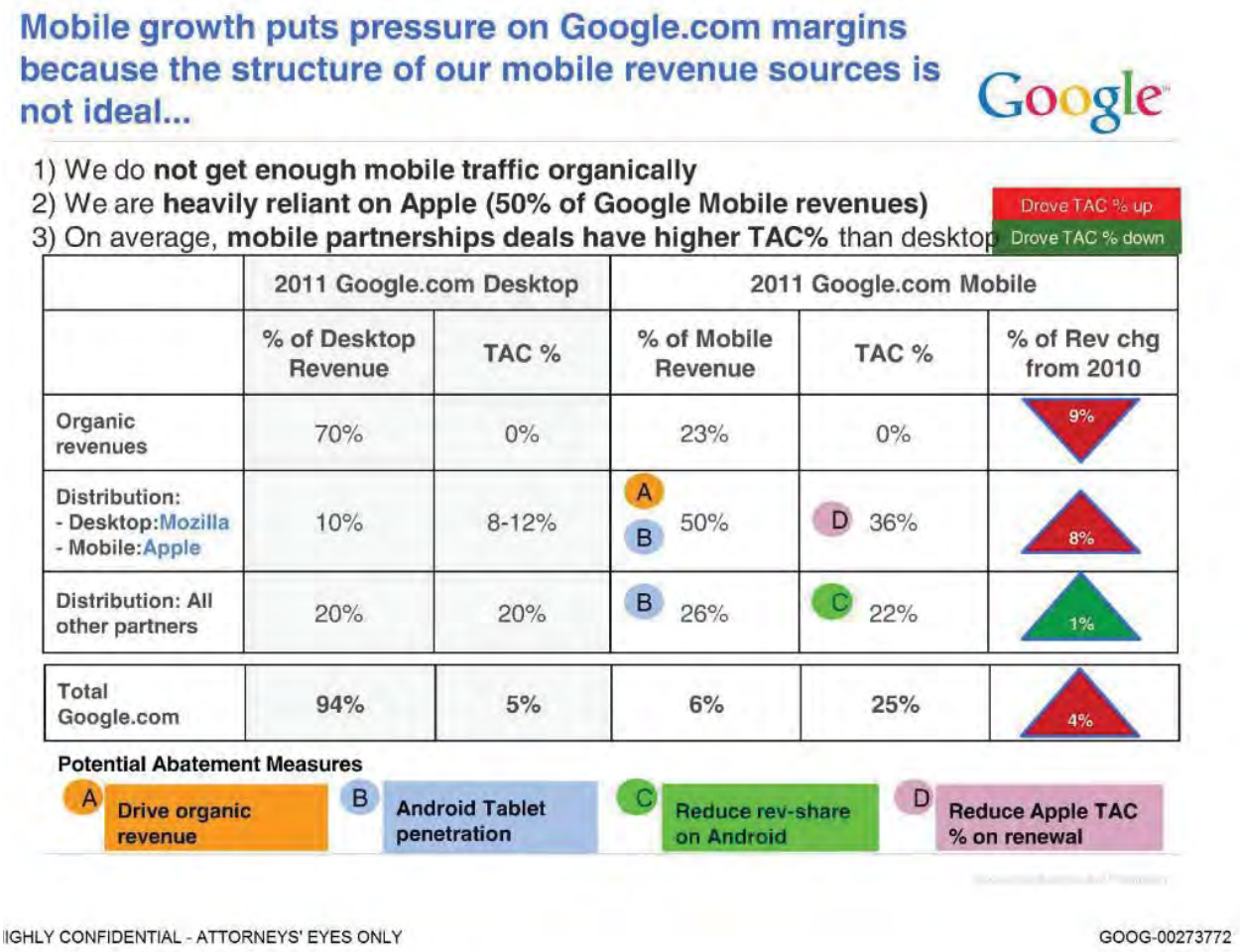
271. From an economic perspective, as Android grows, Google will have stronger negotiating power and greater likelihood of reducing revenue share percentage. For example, even as Android mobile share has surpassed that of iOS in terms of device shipments by the second quarter of 2010, but Google is still highly dependent on Apple - in a manner that continues to be concerning for Google.[390]

272. The revenue derived from iOS users is higher than that of Android users, a topic which is discussed often at the highest levels within Google. While the total dollar amount of revenue that Google has paid to Apple is substantial, the more important metric to consider is the percentage of revenue that Google is sharing pursuant to the agreement. Google's TAC payments to Apple represent [redacted][391] Figure 49 below is from a finance presentation on Google's mobile presence, and the impact on Google's overall business.

[390] Ed Burnette, *Android Sales Surge, Surpass iPhone (Updated)*, ZD Net (Aug. 3, 2010), http://www.zdnet.com/article/android-sales-surge-surpass-iphone-updated.

[391] Dkt. 1436.

Figure 49: Google Presentation on Margin Pressure from Mobile Growth (April 2012)[392]



Mobile growth puts pressure on Google.com margins because the structure of our mobile revenue sources is not ideal...

Google

1) We do **not get enough mobile traffic organically**
2) We are **heavily reliant on Apple (50% of Google Mobile revenues)**
3) On average, **mobile partnerships deals have higher TAC%** than desktop

Drove TAC % up
Drove TAC % down

	2011 Google.com Desktop		2011 Google.com Mobile		
	% of Desktop Revenue	TAC %	% of Mobile Revenue	TAC %	% of Rev chg from 2010
Organic revenues	70%	0%	23%	0%	9%
Distribution: - Desktop:Mozilla - Mobile:Apple	10%	8-12%	A B 50%	D 36%	8%
Distribution: All other partners	20%	20%	B 26%	C 22%	1%
Total Google.com	94%	5%	6%	25%	4%

Potential Abatement Measures

A Drive organic revenue

B Android Tablet penetration

C Reduce rev-share on Android

D Reduce Apple TAC % on renewal

IGHLY CONFIDENTIAL - ATTORNEYS' EYES ONLY GOOG-00273772

The presentation in Figure 49 succinctly summarizes many strategic considerations relating to Android and its impact on Google's commercial business. First, the slide plainly states, "We are heavily reliant on [redacted]." As an economic matter, being heavily reliant on a direct competitor creates a strategic disadvantage that threatens a company's ability to generate profits over the long term.

273. In addition to the frequent discussions of Android's direct impact on Google profits, the broader strategic considerations relating to this vulnerability are discussed often within Google. For example, the excerpts below are from a list of important Objectives and Key Results ("OKRs") for Google executives in which those executives discuss "Project Soy," Google's effort to mitigate the risk Google faced from the potential expiration of its agreement with Apple and its desire to continue to earn lucrative revenue

[392] GOOG-00273770, at 772.

and competitive scale through provision of search on the iOS platform.[393] In sum, [redacted] exhibits a number of characteristics that demonstrate the benefits Google enjoys from its Android ecosystem: (1) avoidance of significant amounts of the high costs it pays to have its search product carried on a competing platform and ecosystem, (2) removal of the risk to Google of displacement of its services including search, and (3) the ability to fully exploit the search and other advertising entry points it enjoys in Android. Further, each of these risks of payment, displacement or lack of exploitation is moderated by the presence of Android's success as counterbalance.

c) Control

274. I described above the economic incentive for Google to retain control of a platform. Control of the Android platform serves both to reduce the risk to Google of lockout or intermediation (by [redacted] and to optimize for profit. Two recent examples demonstrate the significant benefits of control, and the value that Google receives from being able to control the Android platform.

(i) Ad Blockers

275. The direct benefits of control afforded Google by Android can be seen in the recent case of mobile ad blocking applications.

276. Ad blockers are programs that, as the name suggests, prevent advertising from being displayed on a browser or mobile device. Ad blockers pose a substantial threat to Google's advertising-based business model and are noted as a Risk Factor in Google 10Ks.[394] In mid-2015, Apple announced its intention to allow "ad blocking" software in its Apple App Store. Previously ad blockers had been primarily limited to PC browsers, and technical reasons prevented ad blockers in the mobile space.

277. Apple's announcement spurred numerous headlines about the general threat to the online advertising industry, and Google specifically. For example, Wired reported, "Ad blocking plays into Apple's competition with Google in another way, too … By incorporating its own ad block capabilities in Safari, Apple could be kneecapping its archrival while innocently claiming its just trying to improve the user experience."[395] Apple's decision to allow ad blockers on iOS devices hurts Google because Google

[393] GOOG-00130302.

[394] "Technologies have been developed that can block the display of our ads and that provide tools to users to opt out of our advertising products. Most of our revenues are derived from fees paid to us by advertisers in connection with the display of ads on web pages for our users. As a result, such technologies and tools could adversely affect our operating results." Google 10-K 2013.

[395] Greenberg, Julia, *Apple's Support of Ad Blocking May Upend How the Web Works*, Wired, June 12, 2015 (http://www.wired.com/2015/06/apples-support-ad-blocking-will-upend-web-works/)

derives the majority of its revenue from advertising, and much of that comes from iOS mobile ads. Apple makes most of its money from hardware and likely had strategic reasons for blessing ad blockers on mobile devices. Put simply, the decision helps Apple, and hurts Google.

278. In contrast, Google has been able to choose a strategy better aligned with its own economic interests on the Android platform. Google has removed ad blocking software from the Google Play Store on several occasions, particularly on popular apps.[396]

> Google this week reportedly pulled one mobile ad blocker from the Google Play store and prevented another from being updated. The moves come on the heels of Samsung's announcement this week that it was opening up its mobile Web browser to ad blockers. AdBlock Fast, which was one of the first blockers to take advantage of Samsung's largesse, reportedly was tossed from Google Play.[397]

279. While Google has been circumspect about the reason for the ban, the decision makes sense from an economic perspective. Android provides Google with the ability to control a large portion of the mobile industry, and eliminating threats to its advertising business is important to Google's commercial strategy.

(ii) Google Maps

280. The risks of a lack of control can be observed through the case of Apple's introduction of its own mapping app on the iOS platform.

281. When the iPhone launched in 2007, Google Maps was the default map app. Several years later, Apple launched its own map program, Apple Maps. Though Apple Maps was largely rejected by users upon launch and faced serious public scrutiny, Apple used its position of control to steadily mature its product and gain share of iOS users for Apple Maps. Specifically, Apple replaced Google Maps as the default program on iOS devices, requiring users who wanted to use Google Maps to navigate to the app in the App Store, download, and install it. For a period of time, most users still chose to use this manual process to obtain Google Maps, and adoption of Apple Maps remained low. However, recently use of Apple Maps surpassed that of Google Maps on iOS devices. The impact on Google of lack of control on Android is reduced search traffic from Google Maps on iOS devices.

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[396] Wladimir Palant *Adblock Plus for Android removed from Google Play store* Adblock Plus March 14, 2013 (https://adblockplus.org/blog/adblock-plus-for-android-removed-from-google-play-store); Nick Statt *Google removes Samsung's first Android ad blocker from the Play Store* Yahoo News February 3, 2016 (http://news.yahoo.com/google-removes-samsungs-first-android-180226264 html).

[397] John Mello … *Google Strikes Back at Ad Blockers* E-Commerce Times, February 6, 2016 (http://www.ecommercetimes.com/story/83081 html)

282. In sum, the economic interests of Google and its competitors are not always aligned, and in fact are often directly at odds. Relying on a competitor for a large source of a key input such as mobile traffic is risky, and Android helps Google reduce its risk, which is a clear strategic, competitive, and ultimately commercial benefit.

4) Commerciality overall

283. Based on the above analysis, I conclude that Android is a strategically crucial, highly successful commercial product, that Google's copying of the Java API packages was explicitly directed at those commercial objectives, and was in fact a major contributor to their achievement.

B. Analysis of transformative use

1) Legal background on "transformative" use

284. I understand that in assessing how Factor 1 weighs in a fair use analysis, I should consider to what extent the use of the copied work is "transformative" of the original work. I further understand that the term transformative is a term of art in copyright law, which has been defined by the U.S. Supreme Court as follows:

> The central purpose of this investigation is to see . . . whether the new work merely 'supersede[s] the objects' of the original creation [citations omitted] or instead adds something new, with a further purpose or different character, altering the first with new expression, meaning, or message; it asks, in other words, whether and to what extent the new work is 'transformative.'[398]

Based on this definition, from an economic perspective, the test of whether a use is transformative depends heavily on whether or not the use of the copied work supersedes the market for the original work. In this sense, the notion of superseding is essentially the same as substitution in the economic sense.

285. I reviewed an additional case which further articulates this test of whether or not a use is transformative, *Wall Data Inc. v. L.A. Cnty. Sheriff's Dep't*. The decision reads "[a] use is considered transformative only where a defendant changes a plaintiff's copyrighted work or uses the plaintiff's copyrighted work in a different context such that the plaintiff's work is transformed into a new

[398] *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 579, 114 S.Ct. 1164, 127 L.Ed.2d 500 (1994).

creation."[399] The Court further notes, "In cases where 'use is for the same intrinsic purpose as [the copyright holder's] . . . such use seriously weakens a claimed fair use.'" [400]

286. I understand the defendant's use in the *Wall Data* case was found to be non-transformative because the defendant "created exact copies of [plaintiff's] software . . . then put those copies to the identical purpose as the original software." [401] As I will describe, from an economic and market perspective, Google copied the Java API packages for the same purpose as Oracle originally intended for the Java platform, a purpose the Java platform served in a series of prior and subsequent device contexts. (I understand that Oracle's technical experts have concluded that Google used the Java API packages for the same technical purposes as well).[402] Further, Google used this copied material in the same markets as those in which Oracle was licensing its Java platform, harming Oracle's ability to extract value from its copyrighted work. This is clear evidence of market substitution. I will now explain the economic concepts that underlie market substitution and market harm, which to an economist are closely related.

2) Economic analysis of substitution

287. Substitution is a basic concept in economics. At the simplest level, two goods or services are substitutes if having more of one good or service reduces the marginal value to the user of the other good or service. For example, if I have several pencils in my briefcase, the value to me of getting a pen is lower than if I do not have anything to write with at all. While not exactly the same, pens and pencils both provide the ability to write and draw, and are thus substitutes which compete for my consumption. This is known as marginal substitution, because I may decide to keep both pens and pencils. But in either case, the value of one of the goods is dependent on the degree to which the other is present, and vice versa.

288. In some cases substitutability operates at an "all or nothing" level rather than on the margin. While many people may use both pens and pencils, most people wish to own and use only a single mobile phone. So if I have an Android phone and am given an iPhone, I will likely either not use the iPhone or else use it to completely replace the Android phone. This is known as "non-marginal" substitution.

289. Substitutability typically operates non-marginally with network goods (as discussed above). For example, VHS and Betamax video recorders were substitutes as methods for recording audiovisual media content. Both VHS and Betamax have attributes of a network good, *i.e.*, the more people who use VHS

[399] *Wall Data Inc. v. L.A. Cnty. Sheriff's Dep't*, 447 F.3d 769, 778 (9th Cir. 2006).

[400] *Id.* (quoting *Worldwide Church of God v. Philadelphia Church of God, Inc.*, 227 F.3d 1110, 1117 (9th Cir. 2000))

[401] *Wall Data Inc. v. Los Angeles County Sheriff's Dept.*, 447 F.3d 769, 778 (2006).

[402] Expert Report of Doug Schmidt, Jan. 8, 2016. Expert Report of Chris Kemerer, Jan. 8, 2016.

the greater the value of VHS recorders, and the same for Betamax. The formats competed for individual user adoption, as it was highly unlikely a single user would adopt both formats. This meant that substitution between the two formats operated at the level of the entire network, not just at the level of the marginal value to a user of one or the other. In the end, as the number of VHS users increased and VHS gained large share, the Betamax network reached a point of being nonviable and faded away entirely.

290. Analysis of substitutability is made more complex when considering goods and services that are not sold to users directly but are incorporated as components in other goods or services. For example, GE and Rolls Royce do not compete to sell aircraft engines to air travel customers; they compete to sell them to airplane manufacturers. And a given aircraft has a fixed number of engines, which typically are all of the same design. Hence an airplane manufacturer makes an all-or-nothing decision as to whether to buy engines for a given airplane model from GE, from Rolls Royce, from someone else, or conceivably to build its own engine.

291. In this case, the market in which I seek to understand substitution is the market for the Java platform. Google copied and incorporated the Java platform (specifically, the Java API packages) into Android. This use substituted for use of the Java platform in product categories where Oracle potentially and actually licensed or licenses Java. I understand that a given device (mobile phone, e-reader, tablet, smart television) typically only contains a single application platform such as Java or Java-based Android. Because of this, Google's use of the Java API packages in its devices creates non-marginal substitution. In other words, end-customers, such as mobile OEMs and app developers, will choose one or the other, but not both. As I explained above, non-marginal substitution creates a bigger impact on the market for the superseded work, because the work is completely replaced.

292. Substitution in the market for the Java application platform is also exacerbated by the fact that Java is a network good, and the relevant network extends beyond any single device. Each device or user employing the Java platform makes the entire network more valuable. Thus, Google's incorporation of unlicensed Java in the Android platform, and the growth of Android instead of the Java platform, further harms the overall value of the Java ecosystem, and the potential markets in which Java would otherwise be used.

a) Impact of platform economics on substitution

293. In addition to the economic substitution concepts described above, the interplay of platform economics and substitution is important. Specifically, it is important to contrast Google's platform

business model with Oracle's licensing business model to better understand the competitive dynamics affecting the level of substitution in the market for the Java software platform.

(i) Oracle's business model for the Java platform

294. As I describe above, the Java commercial licensing model is designed to balance two goals: wide ranging developer and ecosystem adoption and revenue generation. Oracle employs a strategy based on the idea of network effects and platform economics to achieve these goals simultaneously. As a network good, the value of Java increases as participation from both developers and device manufacturers increases. A large and active developer community building Java-based software is attractive to hardware manufacturers because users are more likely to buy devices for which a rich selection of apps exists. To incentivize developer adoption, Oracle offers Java licensing to application developers to develop apps free of charge.[403]

295. Application developers want their programs to be widely adopted, and in turn want to develop for platforms or devices that have broad distribution. They know from Oracle's "write once, run anywhere" commitment to compatibility that Java-enabled hardware will run their programs.[404]

296. To generate revenue, Oracle offers royalty-bearing and other monetary licenses to the Java platform to OEMs and other platform partners which employ the Java platform on devices such as phones, dedicated servers, e-readers, and many other kinds of devices.[405] [redacted][406]

(ii) Impact on Oracle of Google's model for monetizing Android

297. As I described above, Google has a very successful platform business model in that it generates the majority of its revenue from advertising, thereby subsidizing the use of its software and services by platform participants such as users, developers, OEMs and carriers (in the case of mobile).

298. The difference in Android's and the Java platform's monetization models accelerates the substitution effects I discussed above. This is because from an economic perspective, for a customer

[403] *Java SE Downloads*, Oracle, http://www.oracle.com/technetwork/java/javase/downloads/index-jsp-138363.html#javasejdk (Last accessed Feb. 8, 2016).

[404] Nick Langley, Write Once, Run Anywhere?, Computer Weekly, May 2002 http://www.computerweekly.com/feature/Write-once-run-anywhere.

[405] OAGOOGLE0006739115 at -9125.

[406] OAGOOGLE2000644741.

facing a decision between two products that offer the same benefits (here, an application platform that can run on many kinds of devices and with a robust ecosystem of developers and partners as discussed), with a significant price difference, the rational choice is to select the lower-priced option. In this case, the lower-priced option is Java-based Android. This of course made the competition between Android and the Java platform much more challenging for Oracle.

299. Safra Catz, co-CEO and former President of Oracle, described Oracle's attempts to license in markets where Java-based Android had entered and thereby provided an alternative to the Java platform, "It's pretty hard to compete with free."[407] Additionally, Mike Ringhofer, Director of Worldwide Java Sales, described several instances in which Google's use harmed Java licensing opportunities.

In practice, Android's offering to device manufacturers and other business partners is often even more attractive than "free," as it comes with a revenue sharing subsidy.

b) Substitution of Android for Java licensing

300. The economic concept of market substitution is closely related to the question of whether a use is transformative. A use is not transformative if it is a market substitute or takes away the original audience for a work.

301. In the present case, the non-transformative nature of the use and the market harm go hand in hand. Concrete examples of market harm, detailed below, also provide clear examples of market

[407] Transcript of Jury Trial Proceeding Appearances Vol. 10, April 27, 2012, p. 22.

[408] Deposition of Michael Ringhofer, (Dec. 02, 2015), at p. 39.

[409] Deposition of Michael Ringhofer, (Dec. 02, 2015), at p. 78.

substitution, i.e., instances where Android replaced Java or was used in a product or good that Java could have been used in were it not for Android. For example,

- [redacted]

302. There are many other examples, which I will discuss more fully in my analysis of the harm to Oracle from Google's copying of the Java API packages in Section IX. Each of these is an example of superseding use. Google's provision of the Android platform for free or pursuant to an open-source license does not make it transformative nor any less of a substitute. The central economic question with respect to whether Google's copying is transformative remains whether that use substitutes for the Java platform – which it does regardless of the terms by which Google offers it to its prospective partners. Given these examples, there is no question that Google's use of the Java API packages was not transformative; rather, it replaced Java as an application platform that can run on many kinds of devices in numerous products and services.

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[410] Deposition of Michael Ringhofer, December 2, 2015, p. 69:12-19; 93:7-22.

[411] OAGOOGLE2000180083; Deposition of George Saab, December 16, 2015, p. 62:11-19; Deposition of George Saab, December 16, 2015, p 114:11-14 [redacted]").

[412] Deposition of Michael Ringhofer, December 2, 2015, p. 127:18-25, 128:1-7 (Q. In "Voiceover IP Phones," has Oracle ever had a deal with Cisco or any other company that it lost to Android? A. [redacted]

[413] Deposition of Michael Ringhofer, December 2, 2015 p, 111-113.

[414] OAGOOGLE2000055353; Deposition of Michael Ringhofer, December 2, 2015, p. 26:7-9; 110:9-12.

3) Factor 1 Conclusion

303. To summarize my analysis of Factor 1, Google's use of the Java API packages to launch and profit from its Android platform is overwhelmingly commercial. The use provided Google speed to market at a critical juncture, and control of the Android ecosystem, protecting its search and other advertising revenue, each of which has led to billions of dollars in revenue and profits. Further, from an economic perspective, the fact that Java-based Android supersedes the use of the Java platform, replacing it completely in several identifiable instances, shows that the use is not transformative. For these reasons, I find that Factor 1 weighs strongly against fair use.

C. Dr. Astrachan's Factor 1 analysis

304. I have reviewed Dr. Astrachan's Factor 1 analysis and find that his conclusions with respect to economic considerations underlying the fair use factors are incorrect. In this section, I briefly summarize his opinions and then describe my response to each.

1) Non-transformative nature of the use

305. Dr. Astrachan contends that Google's use of the Java API packages is transformative because Google gave the APIs a "new expression, meaning, or message."[415] Dr. Astrachan further claims that because the Android platform was "designed for use in 'smartphones' – mobile devices with touch-screen interfaces and a framework for running applications," it does not compete with Java SE.[416] Dr. Astrachan claims that Google's use does not "supersede Java SE" and describes that Java SE was targeted at PC developers, not mobile application developers.[417] I understand the expression, meaning, or message of the APIs to be a technical matter and will not address it in my report. However, I will assess Dr. Astrachan's characterizations of the intended use of the Java API packages in a smartphone from an economic perspective, and the related claims regarding superseding, or substitution.

306. Dr. Astrachan's statements are unsupported for a number of economic reasons: (1) Google did not transform the copyrighted work, as evidenced by Android's superseding of the market for the Java platform in smartphone and other devices; (2) the Java platform, including Java SE, was used in mobile devices before Android entered the market; (3) Sun took steps to further the use of Java SE in the mobile devices; (4) mobile devices are on a continuum in which the distinction between feature phones and

[415] Opening Expert Report of Dr. Owen Astrachan Technical Issues Relating to Fair Use, January 8, 2016. P. 51

[416] Opening Expert Report of Dr. Owen Astrachan Technical Issues Relating to Fair Use, January 8, 2016. P. 56; I observe that there is evidence of the Java platform being used in smartphones beyond Android.

[417] Opening Expert Report of Dr. Owen Astrachan Technical Issues Relating to Fair Use, January 8, 2016. P. 52

smartphones was evolving over time and Java was evolving with them, and (5) Dr. Astrachan's comparison misses the point of the substitution inquiry. I describe each of these in turn below.

a) Evidence of economic substitution

307. In Section VIII.B above, I describe the relationship between an analysis of whether a copying is transformative and the economic principle of substitution. From an economic perspective, a use that supersedes the original work is not transformative. The Java API packages serve the same purpose in Android as they do in other Java platforms (as an applications platform for different kinds of devices), and there is clear evidence of competition and substitution between Android's unlicensed use of the Java API packages, and licensed instances of the Java platform in a number of markets.

b) Java used in smartphones

308. Dr. Astrachan's claim that Google's use of Java-based Android in the smartphone market is novel is wrong. Even if it were the correct test under the law, it is factually incorrect. The Java API packages were being used in smartphones with touch-screen interfaces and a framework for running applications in the mid to late-2000s. I shared an example of one such device above, the HTC Touch Diamond. Additionally, as I discuss earlier in this report, Android creator Andy Rubin's previous firm, Danger, Inc., licensed the Java platform to build a Java-based smartphone, the Hiptop. Sun also licensed its Java platform to RIM for its Blackberry line of smartphones. Sun licensee Nokia used the Java platform in its smartphone devices, and as of 2006, had a license to use Java SE, specifically, in mobile devices. In addition, Java was evolving with the mobile phone market. Over time, that evolution meant that both Sun's ME platform and SE platform were options for mobile phones. ME was designed for use on smaller devices and was perfect for early small capacity phones, but as hardware improved and could fit bigger, more advanced systems, SE was also a viable candidate for phones. Indeed, SE was running on both Danger and Blackberry, and Nokia also licensed SE for phones.

Figure 50: Java Technology-Enabled Mobile Device (2003)s[418]

c) Sun's ongoing mobile efforts

309. [redacted], as shown above in Figure 50. I understand from Professor Douglas Schmidt that throughout the 2000s, Sun's Java SE platform became even better suited for increasingly powerful mobile technology. And Sun continued its efforts to expand the presence of the Java platform on mobile. In addition, in April 2007, Sun purchased the intellectual property assets of mobile platform provider SavaJe, a then-current licensee of the Java SE platform.[419] A contemporaneous white paper published by SavaJe described its use of Java SE in its mobile platform:

> Designed from the ground up to run Java applications optimally, SavaJe OS is built around a 32-bit, multi-threaded, multi-tasking, pre-emptive, fit-for-purpose kernel. The SavaJe OS includes an embedded Java

[418] OAGOOGLE3000000021, at -0023.

[419] OAGOOGLE0000424812.

> Virtual Machine (JVM) that is tightly coupled to the operating system kernel, and a complete set of Java libraries. The API for the SavaJe OS is the full range of J2ME and J2SE APIs. SavaJe is a Sun commercial J2SE licensee. The SavaJe OS is fully Sun compliant and is Java branded.[420]

310. An internal Sun email explaining the publicity plan for the announcement of the SavaJe acquisition summarizes Sun's plans to build a mobile platform based on the SavaJe stack, as shown below in Figure 51.

Figure 51: SavaJe Briefings Email (2007)[421]

- Sun plans to create a Mobile Platform. We will take the SavaJE stack, port it to Linux and look at what roadmap is necessary to address evolving market needs. Sun is also creating a new team, led by Tim Cramer, to create solutions that span TV, mobile and desktop. We plan to hire key SavaJe individuals to jumpstart the Sun team focused on mobile.

- We will continue to innovate and grow existing products; this solution will be an addition to the current roadmap.

Sun used SavaJe's platform as the starting point for its "Java FX Mobile" platform in mid-2007.[422] In 2009, Sun launched its Java FX Mobile platform at the Mobile World Congress.[423] Java FX Mobile was a platform specifically designed to address the market for a broad range of mobile devices, as shown below in Figure 52.

[420] *SavaJe OS: Solving the problem of the Java™ Virtual Machine on Wireless Devices*, SavaJe Technologies, Inc., (https://hasbrouck.org/netbook/JVMWhitePaper.pdf).

[421] OAGOOGLE0001342929, at -2930.

[422] OAGOOGLE0001049230.

[423] *Sun Microsystems follows the SavaJe acquisition with the launch JavaFX Mobile*, CCS Insight Hotline, May 20, 2007, (http://hotline.ccsinsight.com/article/Sun_Microsystems_follows_the_SavaJe_acquisition_with_the_launch_JavaFX_Mobile).

Figure 52: Java + You Presentation: Java FX Vision for Mobile (2008)[424]

311. Based on the facts I have reviewed, I conclude that the Java platform was in fact used in a variety of mobile device contexts, including on smartphones.

d) Dr. Astrachan's characterization of the relevant substitution

312. Dr. Astrachan's assertion that Google's use was transformative because Android and Java SE were not substitutes is wrong. His opinion and comparison misses the point of the economic purpose of the Java API packages. Nor is it true as discussed above – Java SE was licensed for use in mobile, Java was running on many smartphones, and Sun was embarking on a trajectory of expanding the use of Java SE in mobile. The relevant economic comparison for a substitution inquiry is the purpose of the Java APIs in software application platforms. In most of its implementations, the "purpose" of Java is not to serve as a full-stack operating system, and certainly that is not the purpose of the 37 Java API packages that were copied. Their purpose is to facilitate the development and deployment of applications across a wide range of devices, the very same purpose that Google's Java-based Android seeks to provide.

[424] OAGOOGLE0004260166, at -0178.

313. Dr. Astrachan's opinions about whether or not Google's use supersedes the use of Java API packages are not grounded in economic analysis. Instead, he describes generally that mobile application developers may have different needs than PC application developers, and insinuates that this makes Google's unlicensed use of the same APIs non-competitive. However, Google's statements demonstrate that a key objective in copying the Java API packages was to attract Java's existing developer base and ecosystem (which includes OEMs and carriers), who would then build applications for the Android platform.

2) Commerciality of the use

314. While Dr. Astrachan does not explicitly express an opinion on whether or not Google's use of Android is commercial, he asserts, with no economic analysis or discussion of Google's business model or the platform market in which it participates, that Android is free. Dr. Astrachan states:

> Notably, Google does not sell the Android operating system. Instead, it makes it available to anyone for free. By publishing the entirety of the Android source code, Google allows anyone to use that source code as is or to modify it, all for no charge. The Android API packages, including the method declarations from the 37 API packages at issue here, are part of that free distribution.[425]

315. The Android platform is not "free" in any economically relevant sense. Rather, it is a part of the Google platform that provides a service to users free of charge in exchange for their behavioral data and the right to monetize their data consumption by selling access to Google's audience to advertisers. As Jonathan Rosenberg, former Senior Vice President of Products at Google, described in a Google earnings call:

> "This is not philanthropy. When [the] web is better more people use it more often and that means they search more often. Android is a leading example of this."[426]

316. Had Dr. Astrachan carried out any economic analysis of Android's market role especially with an understanding of network effects and platform economics, he would have concluded that it was and is explicitly intended to deliver revenue and profit to Google, and has been highly successful in doing so.

[425] Opening Expert Report of Dr. Owen Astrachan on Technical Issues Relating to Fair Use, January 8, 2016. P. 56

[426] Google Inc., "Q2 2010 Earnings Call Transcript," July 15, 2010, p. 12.

D. Factor 1 conclusion

317. My economic analysis of Factor 1 weighs strongly against fair use. Google's use is highly commercial, and the direct evidence of the Java platform being superseded by Java-based Android is clear. These findings are consistent with Oracle's technical experts' finding of non-transformative use. Finally, Dr. Astrachan's assertions are unsupported, and lack any economic foundation. For all of these reasons, I find that Factor 1 clearly weighs toward a finding that Google's use of the Java platform in Android cannot be a fair use.

IX. FACTOR 4

(4) the effect of the use upon the potential market for or value of the copyrighted work [427]

318. In this section, I perform an economic analysis of the effects upon the potential market for or value of the copyrighted work consistent with Factor 4, which I understand to be the most important of the four factors.[428] Specifically, I consider from an economic perspective the effect of Google's Java-based Android on Oracle's potential market for and value of the Java platform.

319. I understand that the markets that ought to be included in a Factor 4 analysis include markets where the owner licenses or could license the work itself. I understand that the Ninth Circuit has stated that "lack of harm to an established market cannot deprive the copyright holder of the right to develop alternative markets for the works."[429] My analysis therefore includes all product markets for which Java would have been an appropriate application platform solution. I also assess whether, if unlicensed copying of the Java API packages for the uses at issue here became a widespread practice, it would "adversely affect the potential market" for the Java platform, which I understand is sufficient to negate fair use.[430] I understand that "[t]his inquiry must take account not only of harm to the original but also of harm to the market for derivative works." *Id*. I consider the effect on the market for licensed derivatives of the Java platform.

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[427] 17 U.S. Code § 107 - Limitations on exclusive rights: Fair use

[428] *Harper & Row, Publishers, Inc. v. Nation Enterprises*, 471 US 539 - Supreme Court 1985, at 567: ("Effect on the Market. Finally, the Act focuses on 'the effect of the use upon the potential market for or value of the copyrighted work.' This last factor is undoubtedly the single most important element of fair use.")

[429] *A&M Records, Inc. v. Napster, Inc.*, 239 F.3d 1004, 1017 (9th Cir. 2001), *as amended* (Apr. 3, 2001), *aff'd sub nom. A&M Records, Inc. v. Napster, Inc.*, 284 F.3d 1091 (9th Cir. 2002) *and aff'd sub nom. A&M Records, Inc. v. Napster, Inc.*, 284 F.3d 1091 (9th Cir. 2002).

[430] *Harper & Row, Publishers, Inc. v. Nation Enterprises*, 471 U.S. 539, 568 (1985) ("More important, to negate fair use one need only show that if the challenged use 'should become widespread, it would adversely affect the potential market for the copyrighted work."); *see also, Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 590 (1994)

320. Oracle has a successful history of licensing Java for use in a variety of device types and this pattern has been impeded substantially by substitution of Java-based Android. As I find above, Google's Java-based Android substituted in existing and potential markets for the Java platform. This substitution is exacerbated by the fact that Google offered Oracle's former customers a solution with much of the same functionality (built upon Google's use of the Java API packages) effectively at no charge.[431]

321. I understand that the burden of proof on fair use is on Google and that includes showing absence of harm. I have not seen evidence from Google meeting that burden. To the contrary, I find that Google's copying causes Oracle significant, ongoing and future harm to the potential market for the Java API packages (the copyrighted works).[432] I also find that if the type of copying that Google engaged in were to become even more widespread, there would be substantial additional harm, greatly reducing Oracle's ability to monetize its investment in Java technology and ultimately substantially decreasing firms like Oracle's incentive to innovate.

A. Summary of harm to Oracle potential markets[433]

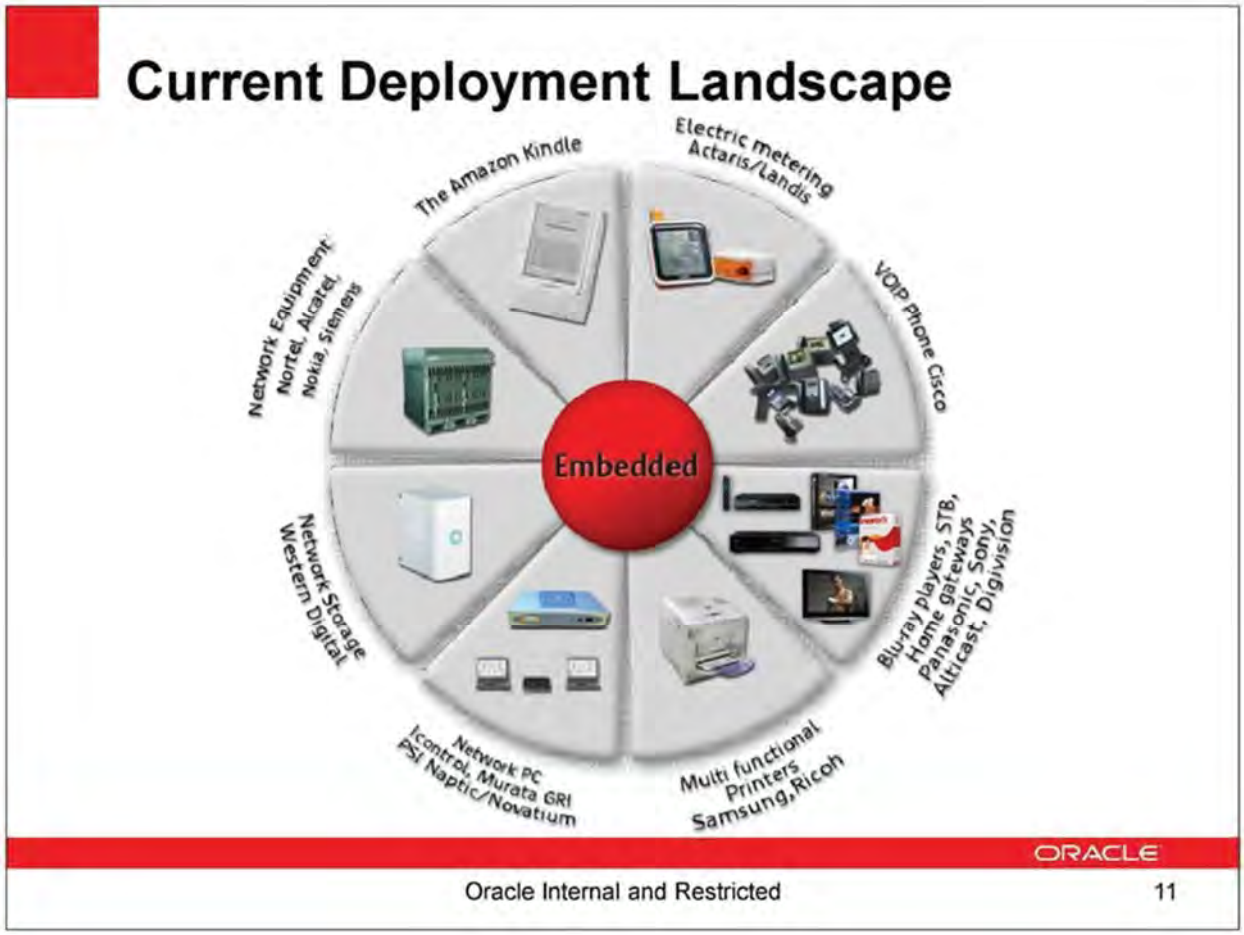
322. The Java platform has been successful across an array of device categories. Figure 53 below, from an Oracle presentation shows the landscape of "embedded Java offerings."

[431] Google paid Oracle's customers through revenue sharing agreements to use the Java-based Android platform, thereby completely undermining the licensing market for the Java platform. Of course, Oracle's current CEO and former President Safra Catz explained that "[i]t's pretty hard to compete with free," but Google actually incentivizes customers to select its Java-based Android platform; Transcript of the Jury Trial Proceedings (Apr. 27, 2012), Vol. 10 at p.2322.

[432] See TX 1344 for a representative—but non-exhaustive—list of actual, potential and lost Java customers.

[433] As part of my analysis of Factor 4, I attach as Exhibit 22 a table of additional licensing-related evidence in the various device categories analyzed in this report.

Figure 53: Oracle Presentation – Java Device Offerings (2010)[434]



These successful device categories (and other burgeoning categories) are critical licensing opportunities for the Java platform. In many of these categories from printers and e-readers to VOIP and home entertainment devices, Java-based Android is competing with the Java platform. This competition is leading to substitution and harm to Oracle's potential market across many key Java device categories.

323. First, I review examples of losses suffered by Sun and Oracle due to Android's entrance into the mobile phone device category. Table 7 below describes examples of reduced revenues and actual lost mobile phone licensing business to Oracle due to Android.

[434] OAGOOGLE0006739115 at -9125.

Table 7: Examples of Harm to Oracle in Mobile Phones (2008-Present)

OEMs & Carriers	Timeframe	Description of Loss
[redacted]	[redacted]	[redacted]
Motorola	2012	Oracle revenue from Motorola "dropped significantly" because of Motorola's commitment to Android.[436]
LG	2011	By 2011, 50% of LG smartphones expected to be Android, resulting in over $1 million in lost revenue.[437]
HTC[438]	2010	HTC noted its Java shipments would "dry up very quickly as they migrate over to Android devices."
Sprint, Verizon, AT&T, T-Mobile	2010	Oracle salesperson, Daniel Green, describes potential deals with major carriers hurt by Android, "I see Android and am run over by it in all accounts."[439]
Sony Ericsson	2008	Sony Ericsson began phasing out Java for Android, resulting in several million dollars in lost Java licensing revenue.[440] [441]

324. Oracle experiences harm well beyond the mobile phone device category. Android's Java-based application platform is being licensed in large and increasing number of Java device categories. In fact, Oracle has already experienced harm from Android competition in a number of these categories, as I show in Table 8 below.

[435] Deposition of Michael Ringhofer, December 2, 2015. p 69:13-25.

[436] OAGOOGLE2000011623.

[437] OAGOOGLE0102403193, at -3199.

[438] OAGOOGLE0001156560.

[439] OAGOOGLE0000799926 ("Carriers don't understand why Android isn't Java, you put Java developers to work directly on the platform.").

[440] OAGOOGLE0000804592, at -4592.

[441] OAGOOGLE0102403193, at -3199.

Table 8: Examples of Harm to Oracle in Other Device Categories (2011-Present)

Form factor	Customer	Timeframe	Description
Tablets & e-Readers	[redacted]	2011	[redacted]
Wearables	[redacted]	2014	[redacted]
Automotive	[redacted]	2015	[redacted]
VOIP	[redacted]	Since 2011[447]	[redacted]
IoT / Smart devices	LGE	2015	Advanced sales discussions with LGE's IoT team for healthcare and smart device stalled, with no license ever materializing.[449]
Household appliances	[redacted]	2013-2014	[redacted]
Printers	[redacted]	2011[451]	[redacted]

[442] OAGOOGLE2000180083

[443] Deposition of Georges Saab, December 16, 2015. P. 62:11-19

[444] Deposition of Donald Smith, December 20, 2015. p114:11-14 [redacted]

[445] Deposition of Michael Ringhofer, December 2, 2015 p. 83:6-10, p. 102:15-18

[446] Deposition of Michael Ringhofer, December 2, 2015. p. 109:12-110:1, p. 110:4-12

[447] *See, e.g.*, Announcing Cisco Mobile for Android, Cisco Communities, https://communities.cisco.com/thread/17883?tstart=0 (last visited Feb. 3, 2016).

[448] Deposition of Michael Ringhofer, December 2, 2015. p. 127:18-25, 128:1-7 [redacted]

[449] OAGOOGLE2000022801, OAGOOGLE2000131360, Deposition of Michael Ringhofer, December 2, 2015. p. 102:12-14

[450] Deposition of Michael Ringhofer, December 2, 2015, p. 83:11-14 [redacted]

Form factor	Customer	Timeframe	Description
Smart TVs	[redacted]	2013-2015	[redacted]

325. The descriptions of account harm above are echoed in Oracle internal documents. A March 2010 e-mail from a Senior Sales Director at Oracle, reproduced below in Figure 54, notes that "most, if not all" Java accounts face direct competition from Android.

Figure 54: Oracle Sales Team Correspondence Regarding Android competition (2010)[454]

From: Lino.Persi@Sun.COM on behalf of Lino Persi [Lino.Persi@Sun.COM]
Sent: Thursday, March 11, 2010 1:28 PM
To: Neal.Civjan@sun.com
Cc: Christina Lucke; Scott Stillabower
Subject: Android Feedback - Americas Region

Neal,

Here's the feedback that I received from the team regarding Android.
While these are examples in various accounts, it should be noted that most, if not all, projects we encounter in our customer base have an Android evaluation plan.

Lino

326. The numerous instances of Android competition and harm in Oracle active accounts across many Java device categories also provide substantial evidence of the economic substitution by Java-based Android for the Java platform.

B. Harm to Oracle's potential market in critical Java device categories

327. The degree of competition from Android brings the potential market harm to Oracle from the substitution of Java-based Android into particularly sharp relief. This harm comes in several forms, most commonly one or more of the following: (1) Google's Java-based Android offering competes with the Java platform to displace current Java licensees, places extreme pricing pressure on Oracle as to existing

[451] Lexmark's new app supports mobile printing, Lexmark, (Nov. 7, 2011).

[452] Deposition of Donald Smith, December 20, 2015. p. 121:3-6 [redacted]

[453] Deposition of Michael Ringhofer, December 2, 2015, p Ringhofer 113:16-114:12.

[454] OAGOOGLE0000207699.

and prospective Java licensees, or forecloses (or significantly undermines) licensing prospects with former, existing, and new or additional customers or market categories; (2) Java licensees' market is challenged by the entry of devices running the Java-based Android platform; and (3) Google seeks to attract developers away from Java or Java-licensed operating systems to Android's own offerings.

328. In this section, I review the device categories in which Google's Java-based Android competes with Oracle's Java platform and in which I observe past, current and future harm to Oracle's actual and potential market. Specifically, I discuss the following markets: mobile phones; tablets; e-readers; wearables; automotive; Internet of Things; VOIP phones; Blu-Ray; televisions and set-top boxes; gaming; GPS systems; vending machines; printers; household appliances; cameras; payment terminals and point of sale systems.

1) Mobile phones

329. As I discuss throughout this report, Google's copying of the Java API packages was driven by time and market pressures in which Google chose to copy the Java API packages without a required license to attract the Java developer community and its established ecosystem partners (which included OEMs and carriers) to help ensure a successful launch of its Android platform and the protection of its search and other advertising core businesses.[455] As one would expect, then, the first and most significant harm to Oracle's potential market occurs in that very same mobile phone market.

330. Beginning in the late 1990s, Java served as the application platform of choice for many of the earliest mobile phones. Sun enjoyed significant early success, as mobile phone adoption increased dramatically through the 2000s. By 2007, approximately 80% of mobile phones worldwide were based on the Java platform. In 2008, Google released Java-based Android without securing an appropriate license. Google's unlicensed use of Java usurped Oracle's leadership position in mobile. By 2015, the share had flipped, with Google capturing more than 80% of mobile phone device shipments with Android.[456]

[455] In my discussion of Google's commercial use of Android, I dissect at length the profits gained and strategic advantages secured in connection with Android's Java-based application platform.

[456] Exhibit 3. As I discuss above, the distinction between mobile phones considered feature phones and those referred to as smartphone changes over time and is not meaningful for my analysis of harm to Oracle's potential market. [redacted] e. *See, e.g.*, OAGOOGLE0100003473, at 500. In any case, the Java platform enjoyed early success in the smartphone category and was supplanted by Android, which is a Java-based platform.

a) Specific instances of lost or diminished Oracle opportunities

331. Android's growth came from Oracle's mobile Java business partners. For example, of the 91.8 million Android activations that took place in the first quarter of 2011, many were devices manufactured by OEMs that were previously some of Oracle's Java licensees: HTC represented 32%, Samsung represented 23%, Motorola represented 15% and LG represented 7%.[457] In sum over 75% of Android activations in Q1 of 2011 were from OEMs that had previously been Java licensees.

332. In **Table 7** above, I describe a number of specific instances in which Java mobile deals were lost or diminished because of competition with Java-based Android. As further illustration of how the competitive pressure from Android affected Oracle, Figure 55 below relates the details of a call between the Java sales team and HTC in which HTC described its shift to Android.

[457] GOOGLE-77-00053555 (Slide 5)

Figure 55: Email Correspondence Regarding Competition for HTC Account from Android[458]

From: Jongin.Lee@sun.com <jongin.lee@sun.com>
Sent: Fri Oct 08 2010 02:40:29 PDT
To: PFEFFERLEN,MICHAEL <michael.pfefferlen@oracle.com>
CC: Edward Senteno <edward.senteno@oracle.com>;Jongin.Lee@sun.com <jongin.lee@sun.com>
Subject: Call regarding TW goaling
Attachments:

Importance: Normal
Priority: Normal
Sensitivity: None

Mike,

Need your help.
Spent 2hr+ meeting with HTC yesterday.
It was a sobering meeting for Oracle as our HTC counterparts explained how their java shipments will dry up very quickly as they migrate over to Android devices. Furthermore and most importantly for us, they intend not to make any prepayment.

This seriously damages fundamental assumptions built into TW FY11 goaling.

I, therefore, would like to get on a call with you either during your Fri. or Mon. next week.
I can do a call on Fri. 10/8 4pm PT onwards or early morning PT on 10/11 Mon.

Please let me know your availability. It is critical we try talk at earliest.
Regards,
James//

Similarly, an email providing data for a presentation to update Oracle executive Charles Phillips, describes the significant challenges Java faced in the EMEA (Europe, Middle East, and Africa) mobile market, replicated below in Figure 56.

[458] OAGOOGLE0001156560

Figure 56: Email Exchange Explaining Impact of Android on Java Platform Sales[459]

On 03/10/10 07:19, Geoff Morton wrote:
Neal

Overview of Android impact in EMEA

1. Nokia
   - They see Android and Apple as the main competitors in the smartphone arena
   - They say they have no plans to adopt Android. They keep to the same story privately
   - Revenue impact : None they still have 6-years to run on their agreement, paying $7m p.a. as a minimum
2. Sony Ericsson
   - They see Android as their primary platform in the smartphone market
   - Until end-CY09 95%+ of all their handsets included Java (approx. 50m units in CY09)
     - They have stated that only legacy phones will continue with Java with final model releases in CY11
     - Last featurephones with Java during CY12
   - Essentially all new smartphone models will be based on Android
     - They have some Win Mobile (approx 3m)
     - Even less based on Symbian S60
   - Revenue impact :
     - Jun-10 they pay there final $5,100k for upcoming year
     - FY11 will have to re-negotiate a new term and/or agreement
       - The forecasted volumes are likely to be around 50% of current agreement levels for FY11 and reducing below this FY12, FY13
     - FY13 could be down to 0% of models shipping with Java

333. Those losses are but a few examples of a much larger trend that was occurring, in which Android use skyrocketed and Java's market share rapidly declined.

334. Google's internal correspondence reflected the competition between Java-based Android and the Java platform. For example, Figure 57 shows a slide from a Q1 2009 Android presentation to Google's Operating Committee, which measures Android's share in the same market as Java ME.[460]

[459] OAGOOGLE0000152466-67.

[460] I understand that the Java platform available for resource-constrained devices is Java ME (which stands for Java Micro Edition). I further understand that the report of Professor Doug Schmidt finds that the evolution of mobile phone devices enables them to run Java SE. However, Java ME continues to serve as an edition of the Java platform for resource-constrained devices. Expert Report of Professor Doug Schmidt. I also note, as I discuss above, there were a number of smartphones that did run Java SE like the Danger phone, the SavaJE mobile platform. There were also Java licenses taken for the use of Java SE on smartphones [redacted] OAGOOGLE2000181111-1146.

Figure 57: Android Presentation to Google Operating Committee (Q1 2009)[461]

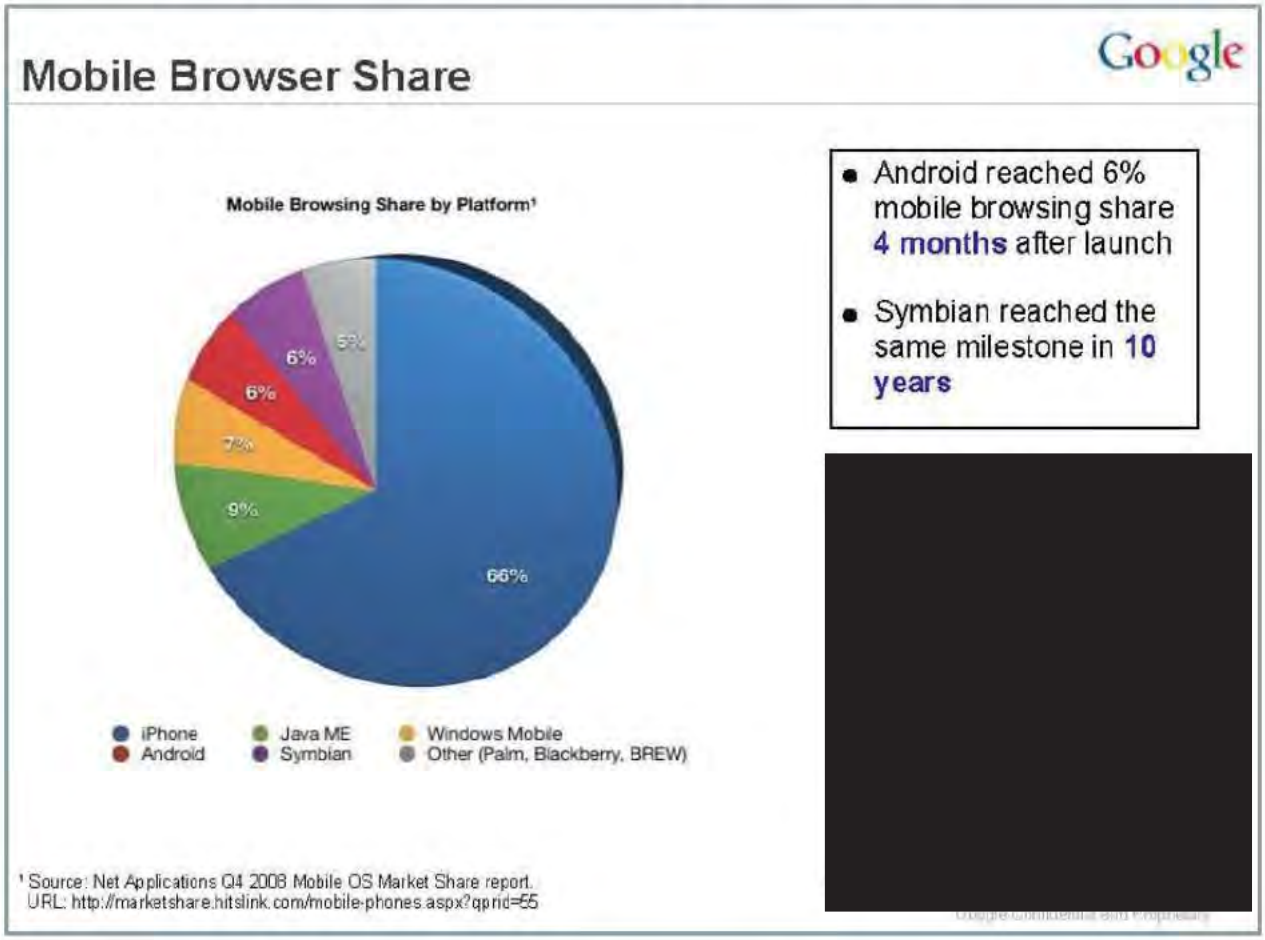
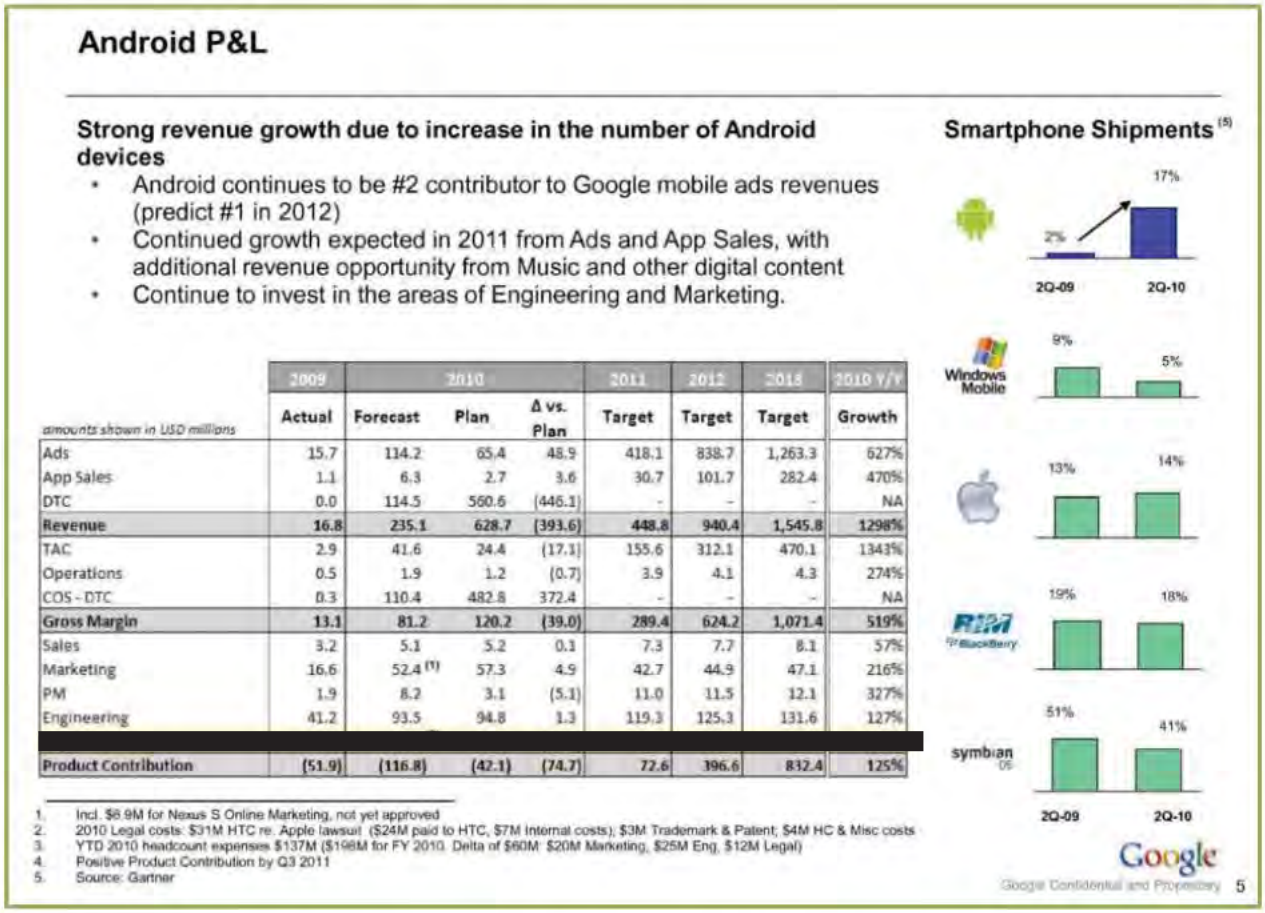


Figure 57 also directly compares Android's performance to Java licensed partners Symbian and Blackberry.

335. In my analysis of the degree of commerciality above, I showed an Android internal profit and loss figure to help understand the revenue generated by the Android platform. That same slide, which I show below as Figure 58, provides a competitive analysis on the right side of the chart. Google's view of the appropriate set of benchmark platforms against which it compares Android platform performance is also particularly instructive. Google compares the Android platform's performance to, among others, the RIM and Symbian platforms – both of which were Java licensees. This benchmarking represents Google's perspective that there is direct competition between the Java-licensed platform and Java-based Android.

[461] GOOGLE-01-00136051, at -6058.

Figure 58: Android Profit & Loss Statement (2010)[462]



Android P&L

Strong revenue growth due to increase in the number of Android devices

- Android continues to be #2 contributor to Google mobile ads revenues (predict #1 in 2012)
- Continued growth expected in 2011 from Ads and App Sales, with additional revenue opportunity from Music and other digital content
- Continue to invest in the areas of Engineering and Marketing.

amounts shown in USD millions	2009	2010			2011	2012	2013	2010 Y/Y
	Actual	Forecast	Plan	Δ vs. Plan	Target	Target	Target	Growth
Ads	15.7	114.2	65.4	48.9	418.1	838.7	1,263.3	627%
App Sales	1.1	6.3	2.7	3.6	30.7	101.7	282.4	470%
DTC	0.0	114.5	560.6	(446.1)	-	-	-	NA
Revenue	**16.8**	**235.1**	**628.7**	**(393.6)**	**448.8**	**940.4**	**1,545.8**	**1298%**
TAC	2.9	41.6	24.4	(17.1)	155.6	312.1	470.1	1343%
Operations	0.5	1.9	1.2	(0.7)	3.9	4.1	4.3	274%
COS - DTC	0.3	110.4	482.8	372.4	-	-	-	NA
Gross Margin	**13.1**	**81.2**	**120.2**	**(39.0)**	**289.4**	**624.2**	**1,071.4**	**519%**
Sales	3.2	5.1	5.2	0.1	7.3	7.7	8.1	57%
Marketing	16.6	52.4 [1]	57.3	4.9	42.7	44.9	47.1	216%
PM	1.9	8.2	3.1	(5.1)	11.0	11.5	12.1	327%
Engineering	41.2	93.5	94.8	1.3	119.3	125.3	131.6	127%
Product Contribution	**(51.9)**	**(116.8)**	**(42.1)**	**(74.7)**	**72.6**	**396.6**	**832.4**	**125%**

1. Incl. $8.9M for Nexus S Online Marketing, not yet approved
2. 2010 Legal costs: $31M HTC re. Apple lawsuit ($24M paid to HTC, $7M internal costs); $3M Trademark & Patent; $4M HC & Misc costs
3. YTD 2010 headcount expenses $137M ($198M for FY 2010. Delta of $60M: $20M Marketing, $25M Eng, $12M Legal)
4. Positive Product Contribution by Q3 2011
5. Source: Gartner

Smartphone Shipments [5]

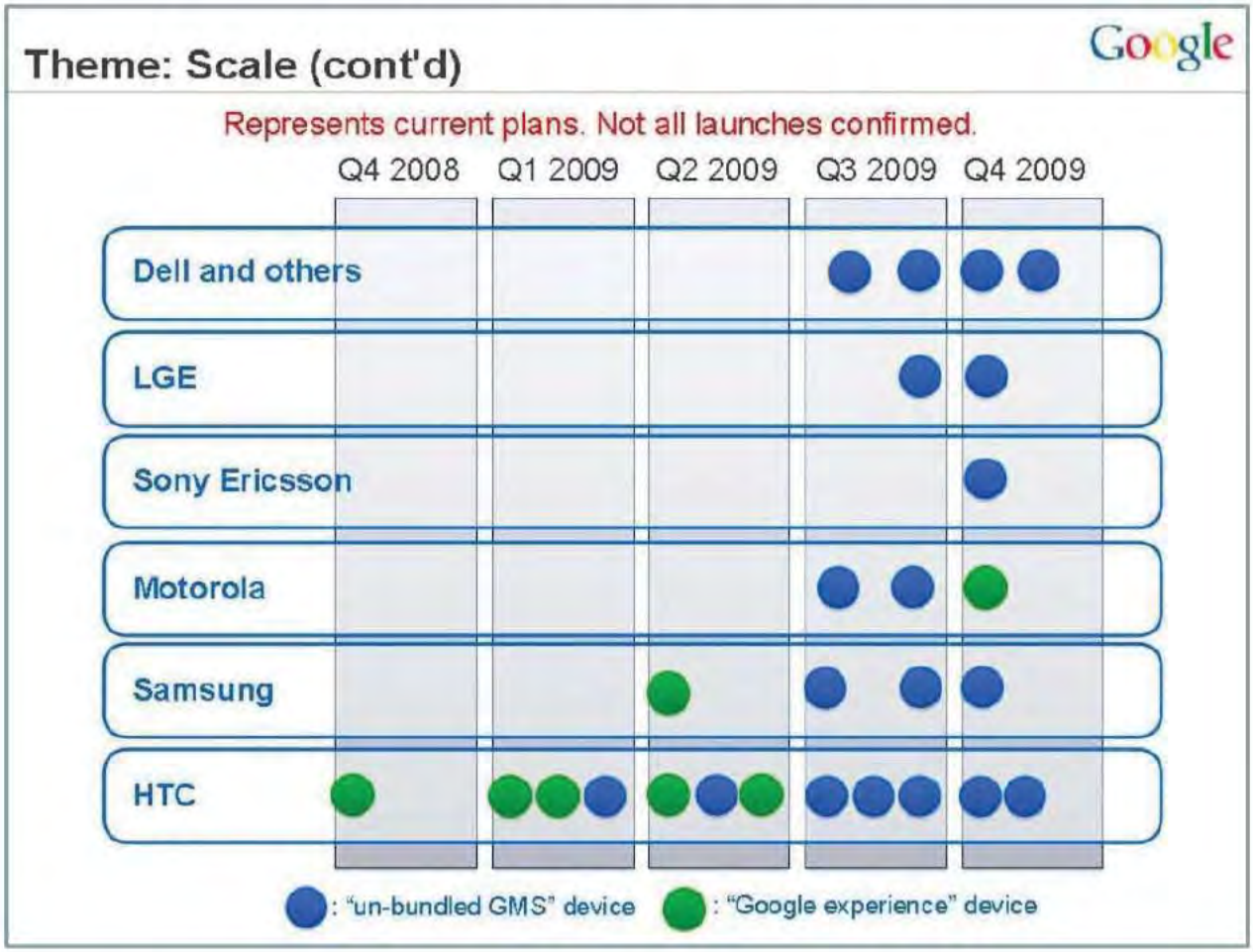
Google

Google Confidential and Proprietary 5

336. The same Google quarterly review has information about progress in securing important Android partnerships. In Figure 59 below, Google executives measure their performance with OEM launches against their goals to achieve all-important scale in the mobile phone market. Several of these key OEM partners, including Samsung, LGE, Sony Ericsson, and HTC, were Java licensees at the time that they were targeted by Google.

[462] GOOGLE-01-00053552, at -3556.

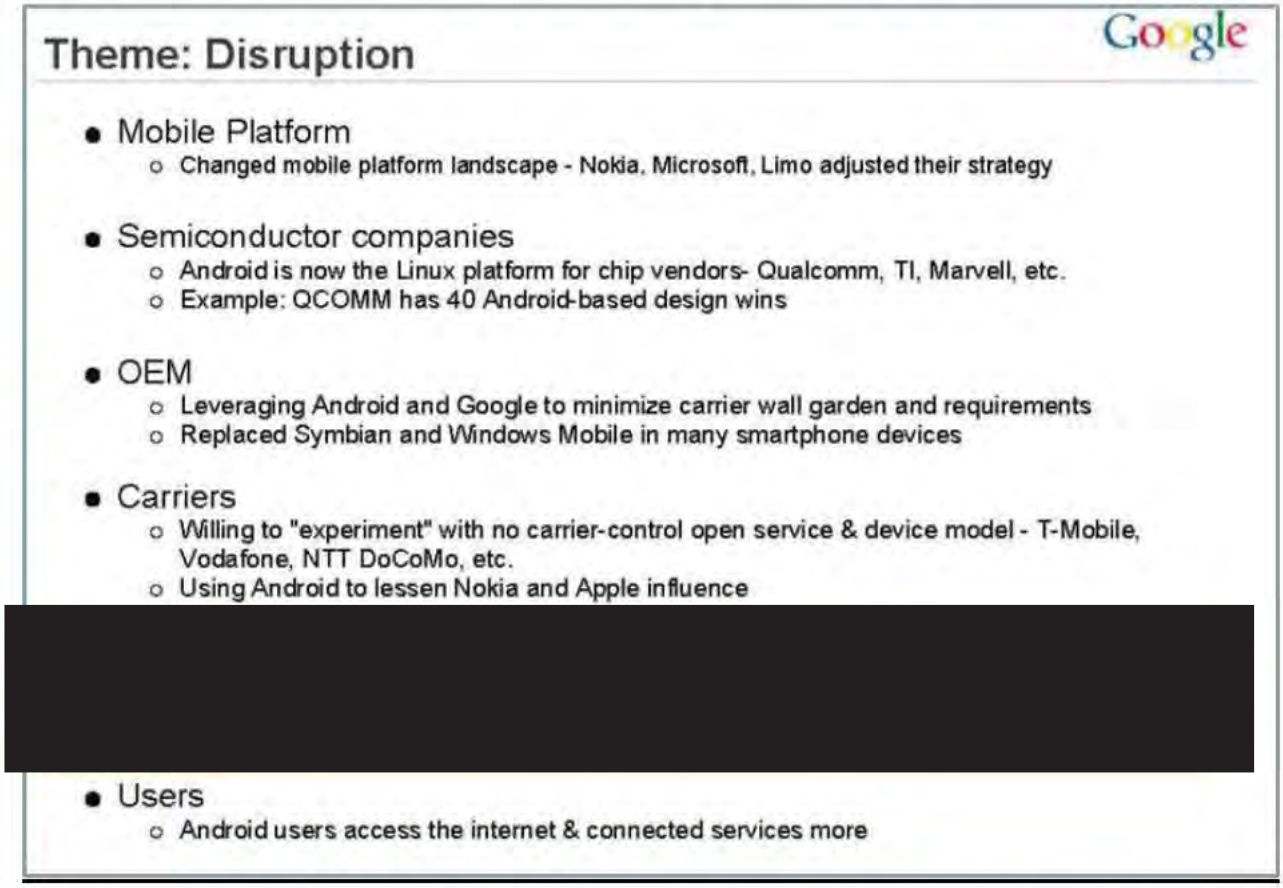
Figure 59: Android Presentation to Google Operating Committee (Q1 2009)[463]



337. In Figure 60 below, the same business review goes on to describe the mobile ecosystem in which Java-based Android and the Java application platform compete.

[463] GOOGLE-01-00136051, at -6069.

Figure 60: Android Presentation to Google Operating Committee (Q1 2009)[464]



Theme: Disruption

Google

- Mobile Platform
  - Changed mobile platform landscape - Nokia, Microsoft, Limo adjusted their strategy
- Semiconductor companies
  - Android is now the Linux platform for chip vendors- Qualcomm, TI, Marvell, etc.
  - Example: QCOMM has 40 Android-based design wins
- OEM
  - Leveraging Android and Google to minimize carrier wall garden and requirements
  - Replaced Symbian and Windows Mobile in many smartphone devices
- Carriers
  - Willing to "experiment" with no carrier-control open service & device model - T-Mobile, Vodafone, NTT DoCoMo, etc.
  - Using Android to lessen Nokia and Apple influence

[redacted]

- Users
  - Android users access the internet & connected services more

This Figure 60 highlights several notable aspects of the competition between Google's Java-based Android and the Java platform. First, under "OEM," Google notes that it "**Replaced** [Java-based] Symbian… in many smartphone devices." Second, among developers, Google states, "Android is ahead of Java."[465]

338. Android VP of Engineering Hiroshi Lockheimer explained certain risks of fragmentation to the Android ecosystem in a June 2015 presentation, as shown below in Figure 61.

[464] GOOGLE-01-00136051, at -6137 (Emphasis added).

[465] GOOGLE-01-00136051, at -6137 (Emphasis added).

Figure 61: Google Presentation Entitled "Android" (June 9, 2015)[466]

339. Mr. Lockheimer uses the Java motto in describing "App developers look for a 'write once, run anywhere' opportunity."[467] This demonstrates that the Android team understood the value of maintaining platform compatibility and the consequential market harm that followed by Google's choice to make Java-based Android incompatible with the Java platform because "

b) Harm from Java-based Android competition across the mobile phone market

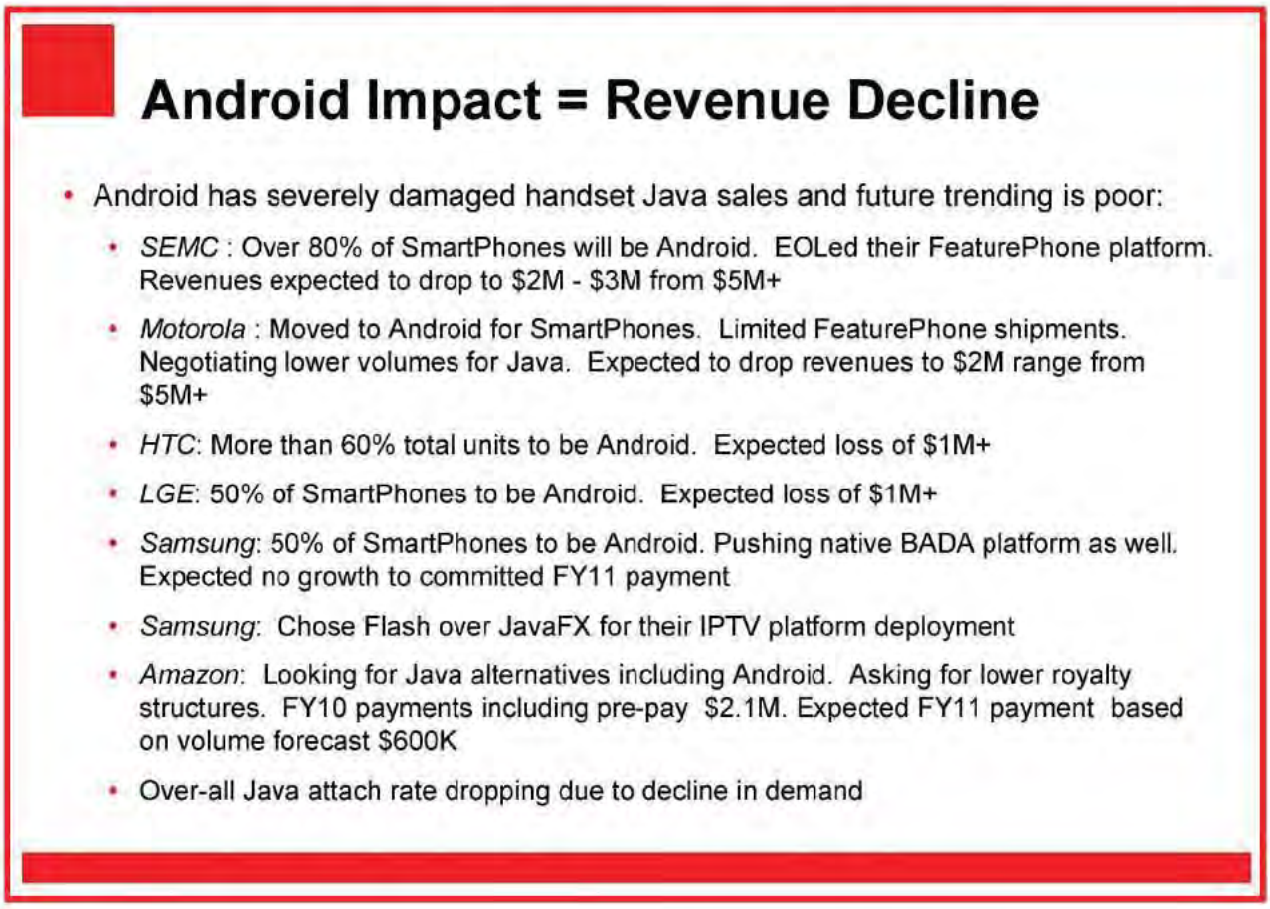
340. Oracle receives none of Google's sizable gains from Android (more than in revenue and the extension of its search and other advertising platform to mobile). Further, the copying of the Java APIs without permission or a required license, greatly reduced Sun's and Oracle's ability to participate in Java's success in mobile phones. I observe specific harm to Oracle revenue, market share and Oracle's failure to capture meaningful share of the growth in mobile phone shipments. I detail each below. Oracle's internal sales team tracked carefully the competitive pressure and attendant losses that Android caused to Java's application platform. Figure 62 shows a July 2010 Oracle internal business review. In the

[466] GOOG-00188553, at 578.

[467] GOOG-00188553, at 578.

slide, Oracle describes revenue declines from Android in the following accounts: Sony Ericsson, Motorola, HTC, LGE and Samsung.

Figure 62: Q1 FY11 Java Sales Review – Android Impact = Revenue Decline (2010)[468]



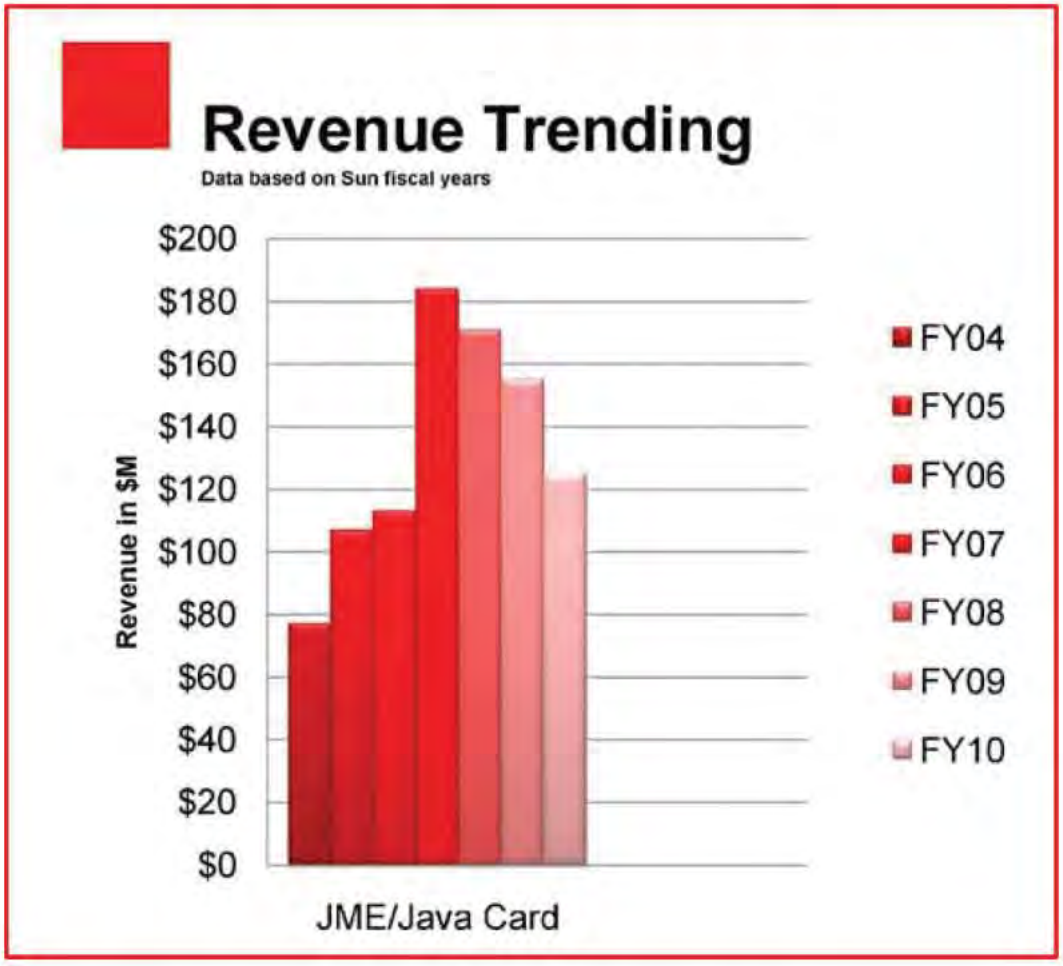
As Figure 62 above shows, Oracle experienced "severely damaged handset Java sales" caused by Android.

Android's competitive harms can be observed in the decrease in revenue generated from Java ME licensing during the key time period.[469] Figure 63, from an Oracle internal business review, shows the decrease in Java ME licensing revenue during the critical period after Android entered the market.

[468] OAGOOGLE0014021245, at -1257

[469] I understand that Java ME is the Java platform for resource-constrained devices.

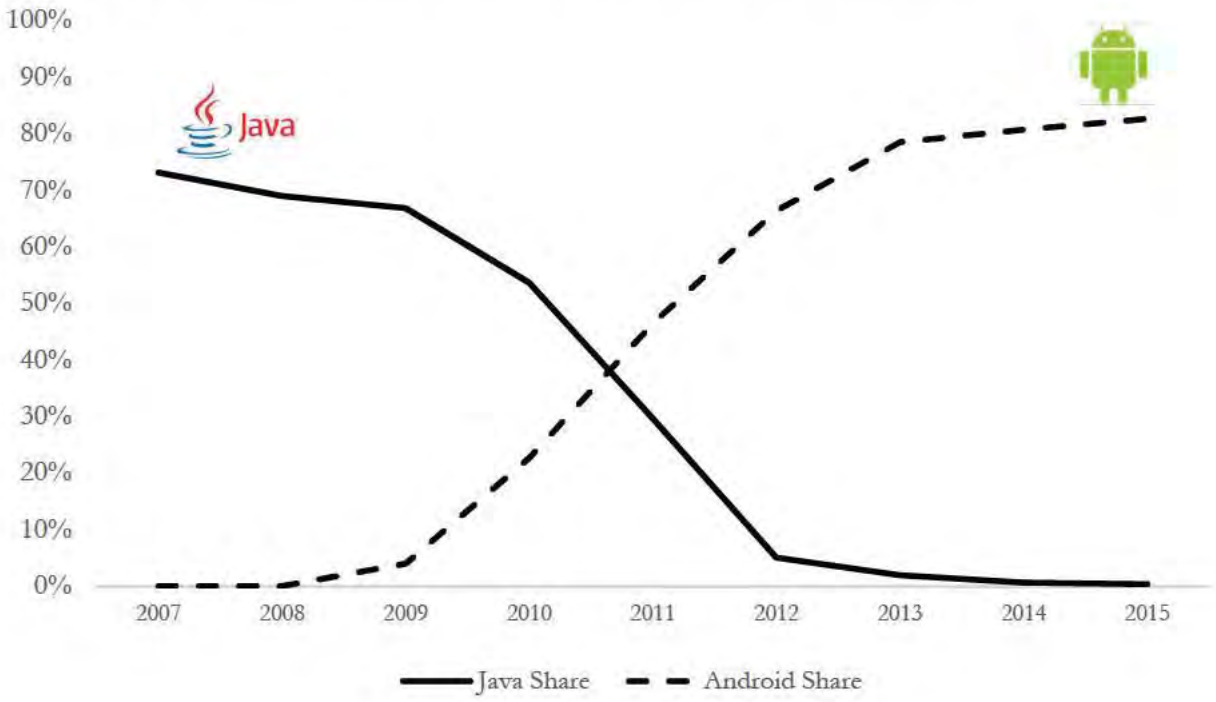
Figure 63: Java Sales Quarterly Review July 2010: Java ME and Card Revenue Decline[470]



341. Figure 64 below shows the decline in licensed Java and the corresponding decrease in Java revenue following Android's growth.

[470] OAGOOGLE0014021245, at -1260.

Figure 64: Java-Based Android vs. Licensed Java Smartphone Market Share[471]



342. It is also important to consider the unit growth in mobile phone devices because it demonstrates what a large market Java-based Android captured from Oracle, and the magnitude of the harm to Oracle from missing this potential growth. Google grabbed 80% market share in a category that was experiencing massive growth. Figure 65 below shows shipments of Java-based Android and Java-based smartphones.

[471] Exhibit 3.